

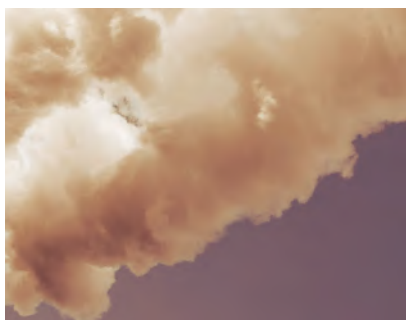
THIRD SHARING EVENT

EUROPEAN CCS DEMONSTRATION PROJECT NETWORK REPORT

HAMBURG

GERMANY

6-7 OCTOBER 2010



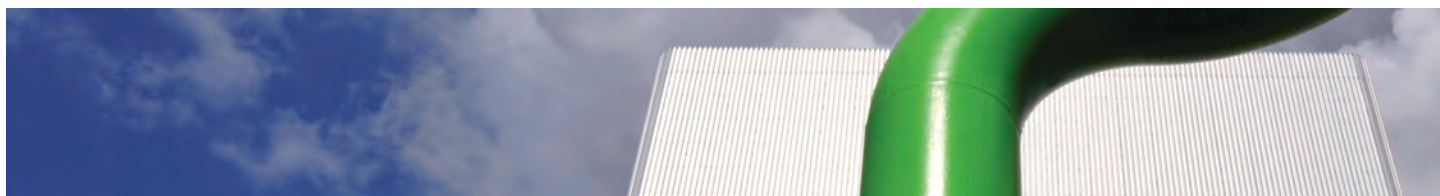


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1 The third sharing event between large-scale CCS projects

The third knowledge sharing event organised by the European CCS Demonstration Project Network brought together 28 representatives from 6 large-scale integrated CCS projects, supplemented by 3 EC officials, 2 guest speakers and a team of DNV facilitators.

The Hamburg event was organised as a follow-up to the first and second meetings and knowledge-sharing events held in Bilthoven, the Netherlands on 28-29 April 2010 and Brussels, 30 June 2010. It focused on further sharing in the themes of permitting, public engagement and risk management.

As at the previous meetings in April and June, six projects granted funding under the European Energy Programme for Recovery (EEPR) participated, namely:

- **Bełchatów, Poland**
- **Compostilla, Spain**
- **Hatfield, United Kingdom**
- **Jämschwalde, Germany**
- **Porto Tolle, Italy**
- **Rotterdam, the Netherlands**

The main objective of the third meeting was to further share experiences in each of the themes and to discuss forthcoming annual thematic reports. This report features the results of the three parallel workshops held on the first day, which aimed to continue the work of the previous two sharing events.

In order to build a fuller picture of the member projects' key milestones and knowledge sharing needs for 2011, the second day focused on consultation exercises that will help to inform the Network's Steering Committee to decide on themes for sharing in the following twelve months.

2 Plenary session Day 1, Oct 6, 2010

The meeting was opened by DNV and Simon Bennett, the Network's project manager from the European Commission, continued with an update on progress with respect to the formation of the Network Steering Committee and provided a summary of the [Advisory Forum meeting](#) held on 17 Sept 2010 in Brussels. The meeting then continued in three breakout sessions, of which reports are provided below.

3 Permitting session

The main objective of the session was for projects to update each other on recent developments within permitting and to continue the work with developing an overview of lessons learned from CCS and other relevant industry permitting processes. It was agreed that the main purpose of the overview of lessons learned was to develop a document/report summarising these experiences and to make them available for the member projects.





3.1 Project knowledge sharing

Each of the six projects gave a presentation of the status on the permitting process and on the development of the regulatory framework for permitting in their respective Member States. The following is a summary of the presentations:

ROAD, The Netherlands

The scope of the ROAD project is to capture CO₂ from the Maasvlakte Power Plant of E.ON in Rotterdam and to transport the CO₂ to depleted gas reservoirs offshore for storage. The permitting process for the ROAD project can be divided in four steps:

- 1 **Overview of procedures.** Establish an overview of formal procedures, the relevant authorities and planning of the permitting process (permits, including conditions for EIA and spatial planning)
- 2 **Preparing the documents.** Draft versions prepared by the ROAD-team. Drafts reviewed by the authorities to make sure the documents meet all requirements.
- 3 **Formal procedures.** The authorities, including a national EIA committee, consider all submitted requests and after public consultation decide on the permit conditions.
- 4 **Legal procedures.** After permits have been granted, legal procedures can be started against the project. Court procedures may take a long time and their outcomes are hard to predict. After final judgements the FID (Financial Investment Decision) can be taken. The schedule for the legal procedures is not clear.

The first step in the permitting process is to identify the regulatory bodies and to get an overview of the formal procedures. In this phase the project met with the central authorities (Ministry of Economic Affairs) and local authorities. The ROAD project stated that because the CCS project is a large scale project with nationwide implications and that the permitting process should be co-ordinated by a national (central) regulatory body (Rijkscoördinatieregeling). The Ministry of Economic Affairs agreed that the transport and storage part of the project could be co-ordinated on a national level. However, the capture plant was not included in this procedure and will have to follow the ordinary permitting processes (without national co-ordination).

There are currently no CCS laws and regulations implemented in the Netherlands and the ROAD project is waiting for the implementation of the EU Directive for geological storage of CO₂. At the same time new permitting procedures have been introduced in the Netherlands. These new procedures allow a number of permits to be combined in 'integrated permits'. This is new to both the industry and to the regulators, therefore there is a need to understand and seek clarifications of the processes where necessary.

The lack of CCS laws, regulations and new permitting procedures is challenging for the project. The industry has limited experience with CCS and there are few standards available. This is also challenging for the permitting process for the first CCS projects being carried out. The projects may lack information that is requested by the regulators. It was suggested that this could be solved if regulators are more pragmatic and approve the idea that permits can be adjusted later, within agreed limits.







It is possible for the ROAD project to obtain a provisional permit for the capture plant, but all risks of changes will be borne by the project.

There will be two Environmental Impact Assessments (EIA) for the ROAD project:

- 1 A Strategic EIA to accompany adjustments in spatial planning.
This EIA is submitted by the authorities (Ministry of Economic Affairs).
- 2 A Project EIA covering the full CCS project.
This EIA is to be submitted by the project.

To meet the scheduled start-up of the full CCS value chain by 2015, it is necessary that the permitting process runs smoothly and that the permits are granted without unexpected delay.

- Lessons learned from the planning process:**
- Keep pressure on all parties involved, including own team:
 - > Propose tight schedules to pressure authorities to take actions and make decision
 - Start with first rough draft versions to get feedback
 - Reduce the largest risks: the legal procedures or legal errors
 - Show that the project is doing everything within its power to meet deadlines
 - > Take the initiative on all meetings
 - Support authorities with technical help
 - > Share knowledge to build mutual understanding of CCS and the project
 - > The authorities often lack resources. The more the CCS projects prepare the better the authorities will be able to fulfil their commitments
 - > Agree on getting permits in more general terms, keeping open the opportunity to adjust when detailed design information is available.

Jämschwalde, Germany

The Jämschwalde project has been granted exploration permits under the Mining Law for two potential storage sites in Brandenburg and is also considering storage in the depleted Altmark gas field in Saxony-Anhalt, which is 300 Km from the Jämschwalde power plant. An application for Enhanced Gas Recovery (EGR) with CO₂ has been submitted to the regulator, but the permit procedure is still pending. There has been a discussion on whether the project is EGR or a purely CCS project and the regulator has decided that there is a need for an application under the new CCS Act.

The Jämschwalde capture plant will be covered by the Federal Emissions Control Act and the Federal Water Act. The modification permit under the Federal Emissions Control Act requires a procedure with an Environmental Impact Assessment and a public consultation. A scoping meeting with the regulators was due to be held on 26.10.10.

The project is experiencing public opposition in potential storage areas. Opposition against CCS is seen as being consistent with opposition to lignite (with open cast mines and power plants) and there is in general mistrust of big infrastructure projects in the energy sector.





Vattenfall has initiated mitigating actions to improve the situation of the project:

- Information campaigns, including establishing an information office in Beeskow (the town in the potential storage area).
- A CCS Committee was established by the Ministry of Economy in Brandenburg. Members are local politicians, the Ministry of Economy, representatives from civil initiatives, environmental organisations, local population and Vattenfall. The Committee is following permit proceedings in Brandenburg; relevant steps in the proceedings are discussed during the meetings of the Committee.

Porto Tolle, Italy

The Porto Tolle project submitted its application for the construction and operation permit for the Porto Tolle Thermal Power Plant to the Ministry of Economic Development in May 2005. The application included the Environmental Impact Assessment.

In July 2009 the project was granted the necessary environmental authorisation. Following this the Ministry of Economic Development has carried out the administrative proceedings involving other competent ministries and regional and local authorities. The construction and operation permit is expected to be granted in 2010.

The Porto Tolle CCS project will capture CO₂ from one of the three combustion units at the new power plant. The construction of the full power plant is scheduled in five years from the date that the permit is granted. However, the plan is to carry out the CCS project during the construction phase of the power plant.

The Italian Government has drafted a Decree to implement the 2009/31/EC Directive on geological storage of CO₂. The CCS storage project will also be regulated by the Legislative Decree 152/06 following amendments on environmental issues. It is still unclear which laws and regulations will cover the capture and transport part of the project. The Ministry of Economic Development plans to arrange a ‘Conference of Service’ where all relevant regulators participate.

At the time of the workshop, the permitting procedure for the Porto Tolle CCS project was yet to be decided. The project sees three potential scenarios:

- Case A:** Exploration permit in compliance with draft decree.
Single permitting procedure for capture, transport and storage under Act 55/2002 covering the energy sector managed by the Ministry for Economic Development.
- Case B:** Exploration permit in compliance with draft decree.
Three different permitting procedures: capture plant (Act 55/02), pipeline (DPR 327/01) and geological storage (draft decree)
- Case C:** Exploration permit in compliance with draft decree.
The draft decree will also address capture and transport.

Figure 1. ROAD and Hatfield representatives in conversation during a break





Bełchatów, Poland

The permitting process for the capture plant (building permit) is ongoing. The permit was approved by the regulators in February 2010 and will be updated in January 2011, before starting the work with building the capture plant. The project has not identified any challenges in this process.

The regulatory framework for CO₂ transportation in Poland is currently under development. Today, the Bełchatów project is planning transportation corridors. According to the schedule the project needs the building permit for the pipeline by August 2013. The storage site will be selected in the first half of 2011. The application for a storage permit is scheduled to be submitted in December 2012.

The Polish Government is working to implement the EU Directive for geological storage of CO₂ in the context of the Polish Mining and Geological Law. The exploration and storage permits are planned to be issued by the Ministry of Environment.

The application for a storage permit will include an Environmental Impact Assessment, including its impact on the specially protected environmental area (Natura 2000), in order to have an 'Environmental Permit' for the storage site. The licensing for a storage site will have to be agreed with the relevant local authority. The storage site operator will also have to submit a 'Plant Operating Plan' to be approved by the State Mining Authority.

Compostilla, Spain

In general, the Spanish Government is supportive of CCS and this is reflected in the stage of the transposition of the EU Storage Directive (Draft Law in the Senate for debate).

Capture plant permits:

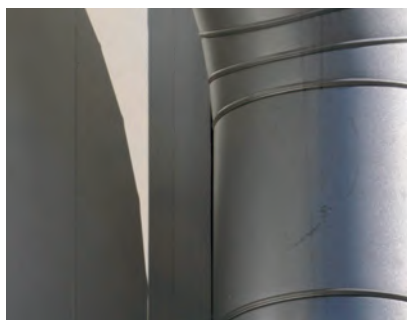
In Spain the permits necessary for the capture plant are covered by the current laws and regulations for the energy sector. Based on the permitting processes described in these laws and regulations it is challenging to reach the target of start-up of the capture plant by the end of 2015. Therefore, Spanish authorities have issued an amendment in the Storage Draft Law (transposition of the EU Directive in progress) with a reference to projects funded by the EEPR that could allow a permitting process that is expedited in order to get the permits on time.

The current status of some of the main permits is the following:

- **Environmental permits:** The project has started drafting the "Initial Document" required by the authorities to start the environmental impact assessment process.
- **Administrative permits:** Application for a permit for connecting to the national grid has been submitted.

Transport permits:

In Spain, at the moment, there is no regulation for CO₂ transport. Standards have to be developed according to the Draft Law on Storage (transposition process in progress) and it is expected that CO₂ pipelines will be regulated by similar laws and regulations as natural gas pipelines.







3.2 Lessons learned so far

In the two previous workshops the member projects have shared lessons learned from permitting processes in CCS projects and in other relevant projects, for example from power plants, natural gas infrastructure and power transmission. At the second sharing event Star Energy presented its experiences with permitting processes from gas storage in the UK as input to the permitting session.

The objective of this meeting was to build on these lessons learned and to structure and elaborate on the identified lessons. The group agreed that the overview prepared so far covered the main lessons learned, but that there is a potential for increasing the level of detail and to add examples or case studies from the member projects.

DNV structured the findings from the second meeting as a starting point for further work in this meeting. The lessons learned and good advice that has been described so far can be categorised as:

- 1 General advice
- 2 Practices directed towards authorities/regulators
- 3 Practices directed towards the consultation process

The participants were divided into smaller working groups to elaborate additional information and examples. The results from this work are summarised as follows:

1 General advice:

- Communicate with all stakeholders if necessary;
- Do not underestimate the strength and power of the local population;
 - > In Germany protests of local initiatives led to deferral of the CCS legislation;
- In Germany the Ministry of Economy for Brandenburg has set up a CCS Committee to involve relevant stakeholders (including politicians, environmental NGOs, Vattenfall etc);
- Maintain continuity of key people in the project organisation;
- Remember the holistic approach; ensure your plans are broader than just a technical focus;
- Prepare and present alternatives to stakeholders early in the project planning stages;
- In the UK the early presentation of ‘strategic options’ is encouraged e.g. to demonstrate the relative merit of different transportation methods e.g. road/rail/ship/pipeline;
- Map potential/different project challenges to anticipate solutions;
- Be open, honest and flexible;
- Prepare for longer permitting process than initially planned. There is a risk that the process takes longer than could be expected;
- Develop a framework to facilitate discussions with landowners;
 - > Try to ascertain the status of public investment to help inform landowners;
 - > In the UK and Germany it is expected that some landowner engagement processes that are used for natural gas pipelines or electricity lines will be applicable for CCS projects;
- Understand the planning process as fully and as early as possible;





- Think about impact on other infrastructure projects;
- Ensure that existing procedures and agreements are known and available for examination during the life-time of the project.

2 Practices directed towards authorities/regulators:

- Communicate your needs to the public authority especially when no legislation is in place;
- In the UK the status of the Hatfield project as an EEP competition winner has enabled the Crown Estate to consider granting a storage lease;
- In Germany extensive communications with the Authority made it possible to get permits for exploration of storage sites under the existing Mining Law;
- In Spain the national authority has proposed amendments in energy legislation to facilitate a more efficient permitting process for the CCS demonstration projects (to meet the 2015-2020 deadlines);
- Understand who does what in the various regulatory institutions;
 - > Identify the decision-making authority during the permitting process particularly in a situation that lacks relevant laws and regulations or with limited experience with such permitting processes;
 - > Involve local and regional authorities at a preliminary stage;
 - > Local authorities should be involved from the early stages of the project in order to create common tasks. This is in the interests of the authorities and the project developer;
 - > Submit easy-to-understand documents to authorities;
- Pay attention to local and regional elections;
 - > If possible, the consultation process should be suspended until election campaigns have finished;
 - > There is a need to communicate with all political parties (in power and in opposition) so that if government changes key position holders are already well informed about the CCS project;
- Make sure that the project complies with the permitting process from a legal perspective, which is challenging when the legal framework is still under development;
- Prepare consistent documentation and messages to speed up the process.
- It is important to communicate that CCS is a joint action with the EC, Member States and industry;
- Take opportunities to participate in wider energy policy debate to emphasise the positive role of CCS e.g. National Grid contributes to various EU & DECC consultations e.g. EU Energy Infrastructure Package and DECC's 2050 Pathways consultation;
- CIUDEN presents news on progress of the Technical Development Plants (TDP) for capture and storage within the EU project (radio, regional TV, local newspapers, special supplements in El Pais, Web and TVE).



3 Practices directed towards the consultation process

- Manage a proactive public relationship programme;
 - > The ROAD and Compostilla projects organise campaigns (2-3 times/year) to involve NGOs, environmentalists, citizens, local press, TV, town hall, technicians (plants involved);





- > Vattenfall set up an information office in the potential storage area and government of Brandenburg set up a committee as a consultation body for the stakeholders;
- Undertake a complex analysis of the project location;
 - > The ROAD project identified stakeholders for power plants project by project; case by case;
 - > It is important to avoid situations where any group of stakeholders feel that they have been left out of the consultation process
 - > Make stakeholders feel involved;
 - > ROAD sent letters of invitation and arranged face to face meetings to explain the whole CCS chain with the most relevant stakeholders;
 - > Compostilla and Bełchatów participated in debates on regional TV and arranged visits to the sites of the CCS installations;
 - > The Scottish Government held a workshop in CCS permitting processes with all relevant stakeholders;
 - > Build personal relationships;
 - > Identify benefits from projects for the local communities;
 - > The Compostilla and Bełchatów projects explain that some benefits of the CCS projects are employment opportunities;
 - > The ROAD project contributes to the Rotterdam Climate Initiative;
 - > It is important for the project developer to understand what kind of benefits are expected by the local community;
 - > Point out employment opportunities that the CCS projects could generate;
 - > Written answers are part of public consultation (include Questions and Answers (Q&A) in consultation documents);
 - > The Spanish Technology Platform for CO₂ (PTE CO₂) prepared a Q&A that was sent to the main stakeholders
 - > Undertake analysis of previous public acceptance issues to anticipate possible problems;
 - > In the Netherlands there are experiences with CCS projects in Barendrecht and Groningen. In both projects the public was invited to a conference with the operator. Both of these projects experienced bad results from shallow consultation;
 - > Information campaigns to involve politicians, experts and local communities at the same time;
 - > The ROAD project (and other projects) has arranged site visits, face-to-face meetings with local, regional and national authorities as well as the central government;
 - > The Bełchatów project organised the external public engagement campaign.





4 Public engagement session

Following a round of introductions participants from each of the member projects, supplemented by a representative from the EC and 2 DNV facilitators engaged in the dialogue on public engagement. The public engagement session featured a guest presentation by Ynke Feenstra of the Dutch Energy Research Centre (ECN).

4.1 Discussion on NETL Best Practices¹

The morning session began with Porto Tolle outlining how its public engagement activities have followed the [NETL guidance](#) that has been a framework for discussion in the previous two sharing sessions. One point which Porto Tolle raised was the issue of branding: it is branding CCS as standing for *Climate Change Solution*. Additionally, Endesa and Enel have established a training initiative “play energy” with local schools in the area surrounding the project site. Porto Tolle has been promoting 100% efficiency as an aspirational target. Others felt this could be misleading as it gives the impression that 100% efficiency is technically possible to those that do not understand the technology. In a similar way to the city twinning concept for encouraging cultural exchange, it was suggested that the communities living close to EEPCCS projects could be twinned in a similar way to encourage interaction.

Branding seemed to be something that a number of the other projects were focusing on with some of the projects setting up stand-alone websites separate from their corporate owners. The ROAD project had taken an interesting step to create its own logo and market this for the project instead of the E.ON or Electrabel corporate logo. So far the ROAD project has found this to be an effective measure and E.ON and Electrabel are not generally associated with the project by the general public. Vattenfall agreed that this approach is indicative of the German approach, where companies do not require their corporate logos to be associated with the project. In contrast, National Grid, which is a major gas and power transmission operator in UK and a likely CO₂ pipeline operator, is happy to have its logo associated with the project and CCS.

Compostilla also went through its public engagement activities and how they met the criteria of the NETL guidance. One important point to note from the Compostilla work is that it has been using the ESTEEM methodology, which was elaborated on by the guest speaker’s presentation.

The goal of the public engagement group is to produce a document, which outlines what activities each project is undertaking in line with the practices outlined in the NETL guidance. It is intended that this document will be updated regularly with activities the projects undertake at subsequent meetings. DNV will take the role of co-ordinating the creation of the NETL table in the format shown overleaf in Table 1. The table is shown here to demonstrate its format. Projects will inform the Network of their activities and they have also been encouraged to identify additional practices to those recommended by NETL. It was agreed that a 2010 progress overview of public engagement activities be developed and shared beyond the Network’s membership.

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¹ http://www.netl.doe.gov/technologies/carbon_seq/refshelf/BPM_PublicOutreach.pdf

Figure 3. Participants listening intently during the public engagement knowledge sharing session.





NETL PRACTICE	PROJECTS					
	bełchatów	compostilla	hatfield	jämschwalde	porto tolle	ROAD
1 Integrate Public Outreach into Project management						
2 Establish a strong outreach team						
3 Identify key stakeholders						
4 Conduct and apply social characterisation						
5 Develop an outreach strategy and communication plan						
6 Develop key messages						
7 Develop outreach material tailored to audience						
8 Actively oversee the outreach throughout the life of the CO ₂ storage project.						
9 Monitor the performance of the program and changes in public perceptions and concerns						
10 Be flexible, refine the outreach program as warranted						

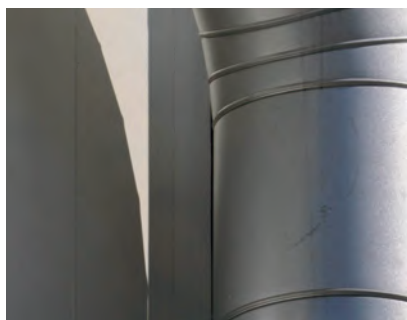
Table 1: NETL practices table structure

4.2 Case Studies

Participants were asked to prepare public engagement cases studies that could be discussed with the group. A template for discussing the activities was sent to all the participants and they were to prepare cases of successful and more challenging engagement activities to be discussed at the meeting. Three cases from different projects were discussed and documented at the meeting from the ROAD, Hatfield and Bełchatów projects.

ROAD discussed its preparations for an upcoming engagement at a local town hall meeting. In this activity, the ROAD project and the Ministry of Economic Affairs, which is responsible for licensing the project, are engaging with the local community. A lesson that has come from the preparatory processes for this engagement was undertaking a dry run of the meeting, which included representatives from the Global CCS Institute and the Lacq project in France. The dry run showed that – as one example- the materials presented the CCS energy penalty in a negative light and needed changing to be as positive as possible and avoid negative messages. Another lesson learned from this activity was that there need to be enough representatives from the project and the Ministry for the meeting participants to interact with and discuss concerns with.

The Hatfield project discussed an interesting recent series of events in the UK that has led to a UK-based NGO, Green Alliance, writing a letter of support for CCS to the UK Government Treasury. The letter was written because of recent rumours that a levy on electricity consumers for funding CCS demonstration in the UK may be cut in the impending Government spending review.







The letter was signed by major power generators, developers, equipment and technology suppliers, storage license holders and academics and sent to the UK Treasury and the Financial Times. Since the Hamburg meeting the letter has been published in the Financial Times, but the impact of this will only be seen when spending cuts are announced at the end of October 2010.²

The Bełchatów project discussed the novel public awareness campaign according to the I phase of site examination works within storage component of the Project. They had undertaken this activity in local communities, using a marquee to display information on geological surveys being undertaken for their CCS project. The aim of the exercise is specifically to raise awareness and acceptance of the geological surveys being undertaken for the CCS project with the land owners and local nearby communities. The project gives the community access to brochures specific to Bełchatów and also more general brochures from the EU funded CO₂GEONET project, along with the opportunity to talk to representatives from the Bełchatów project. The project has had positive feedback on the effectiveness of a study undertaken by external consultants. This project has shown that it is important to start engagement as early as possible and not to overload the stakeholders with information. In this regard the Bełchatów project is engaging the stakeholders at each step of the project's life cycle.

Following on from the case studies, the template was reviewed to establish its effectiveness in documenting the public engagement activities. It was agreed that it was good for telling the story and monitoring the effectiveness of an engagement activity, but the projects were interested in additional aspects. A section was subsequently added for the time and resources required for a particular engagement activity and also a section to comment if the project would repeat the activity in hindsight. Projects are encouraged to complete the templates on the intranet and also to present case studies at future Network meetings.

4.3 The ESTEEM toolkit

ESTEEM³ is a tool to measure and create public acceptance developed by the Energy Research Centre of the Netherlands (ECN) with the help of funding from the European Commission's research programme. The tool was not developed specifically with CCS in mind, but was created with new energy technologies in mind. The ESTEEM tool has been trialled in energy projects with technologies including: wind, solar, biomass, hydrogen and CCS. The process involves six steps outlined in Figure 5 at is led by an independent body, "the consultant", in conjunction with the developer, "the project manager".



Ynke presented the differences between societal acceptance of projects and support for projects which are fundamental to the ESTEEM philosophy. ESTEEM recognises that there are a number of different stakeholders and every project will have a unique set of stake- holders, none of whose input is less important than any other. One of the key features of the ESTEEM process is step 5, getting to shake hands. This type of stakeholder meeting allows stakeholders to voice their opinions in the absence of the project manager

² At the time of writing no spending cuts have been announced at National level in the field of CCS

³ <http://www.esteem-tool.eu/>



and ECN have found through experience that the stakeholders moderate each other's views and dispel some of the concerns.

The ESTEEM process was applied to the Zero Emission Power Plant (ZEPP) project in Drachten, Netherlands as a case study. The 50MWe natural gas oxy-fuel CCS project has subsequently been scrapped due to technology issues. During the stakeholder workshop 100 strategies were identified, 45 of which the project manager saw as feasible. Through this and the other case studies it was found that it is essential to start the dialogue with the project as early as possible at a stage when plans still have an element of flexibility and stakeholders have yet to form opinions. It was also found to be essential to have two-way communications through trusted sources and to focus on the benefits for and expectations of the stakeholders and include as many of these as possible in the design.

Earlier in 2010, Ynke attended the nuclear industries public engagement conference (PIME⁴). At this event she presented her work with CCS and received feedback about the differences between communicating CSC and nuclear. One comment received was that "CCS is now where nuclear was 20 years ago" in terms of its level of uncertainty about how to communicate the technology to the public. It is clear that in recent years the nuclear industry has taken actions to give importance to communication and stakeholder engagement. Although there are some major differences between CCS and nuclear in terms of technology, risk and concerns, there may be much to be gained from reviewing work already undertaken for other energy technologies, including nuclear and renewables. In light of this it was decided to attempt to set up a web-based meeting with a guest speaker from one of these other energy sectors.

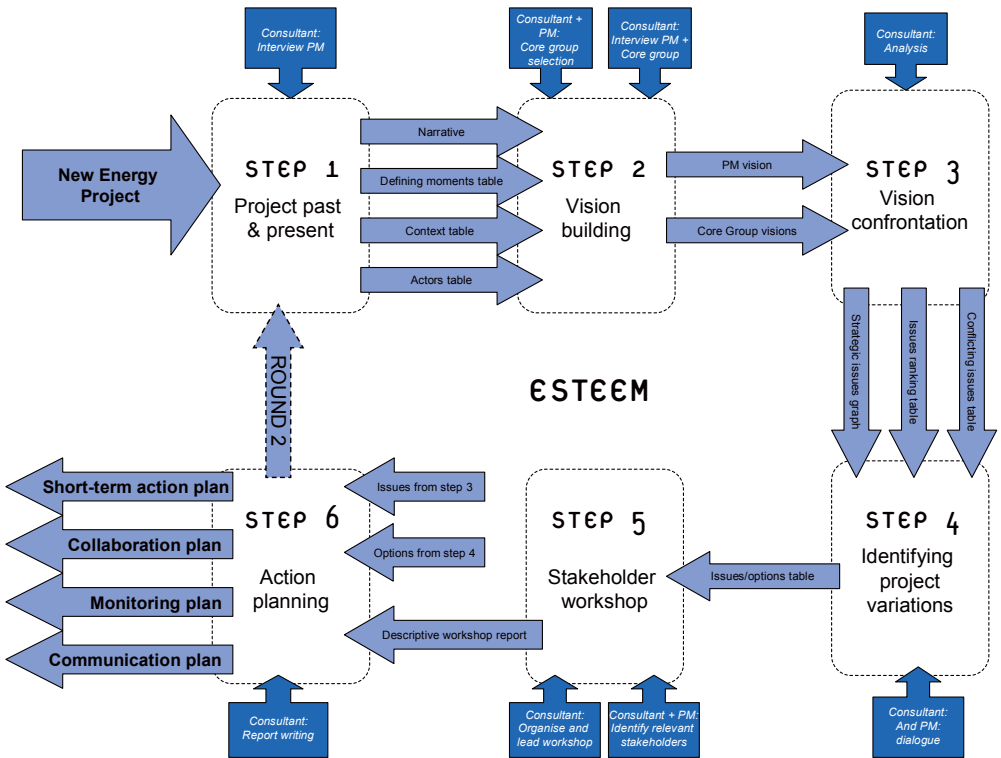


Figure 4: Ynke Feenstra of ECN presenting the ESTEEM tool for measuring and creating public acceptance.



Figure 5: The ESTEEM stakeholder engagement process flow

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4 <http://www.euronuclear.org/events/pime/pime2010/index.htm>





4.4 Eurobarometer survey on CCS Public Awareness and Acceptance

The EC's Directorate-General for Energy is due to undertake a Eurobarometer survey as a part of its CCS programme. The survey's goal is to gauge support for CCS in the Member States that are hosting projects funded under EEP scheme and those Member States with ongoing or planned CCS projects. The questions currently included in the survey were put to the meeting for feedback and to discuss the need for additional questions.

The feedback was mostly related to tailoring the questions to get more relative feedback on the perception of CCS related to other energy technologies, such as unabated coal and offshore wind. There were requests to include a question about the cost of CCS compared to other CO₂ abatement technologies. There is a feeling amongst the projects that the questions should establish how people compare the risks of nuclear, CCS and driving a car for example. The projects are also keen to establish how much more people are willing to pay for clean electricity and if CCS cost less than other low carbon technologies would they be more supportive. Projects were also interested to know the location of the participants in the survey relative to a CCS project. More generally there is a need to establish stakeholders' awareness levels relating to what produces CO₂ and what processes produce the most. There is also a need to establish how awareness levels correlate to the levels of education amongst stakeholders.

4.5 Key Public Engagement Messages from the Network

Through an exercise in the meeting, a number of key target groups for receiving messages were brainstormed and a series of draft messages for a selection of these targets groups were generated. Furthermore, a first attempt at an overarching message was undertaken. The resulting matrix will be further developed and published.

4.6 NGO positions and updates

A template has been uploaded to the Network intranet for projects to share information about their interactions with NGOs. The agenda had allowed time to begin populating the template, however, due to enthusiasm of discussion on earlier topics there was not time to do this. It is now intended that this activity will be carried out online using the Network's intranet.

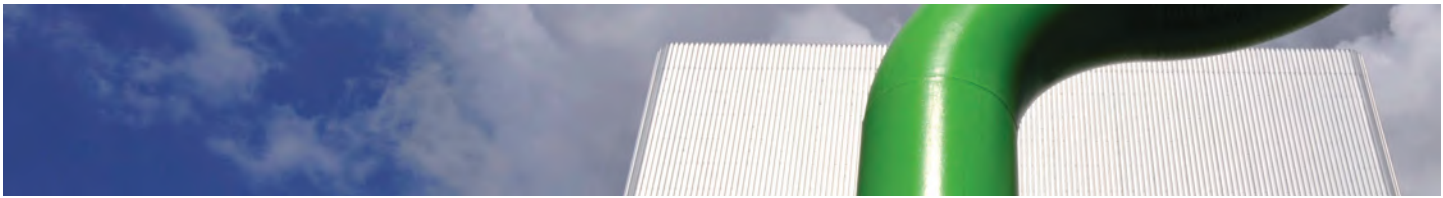
5 Risk Management session

During the previous Network event held in Brussels, it was agreed to invite a guest speaker to develop a further understanding of the risks related to CO₂ stream composition.

5.1 The Statoil experience

Geleijn de Koeijer of Statoil was kind enough to present the company's experience with CO₂ transport. Geleijn is working for Statoil R&D on CCS and has been involved in many of Statoil's CCS initiatives.





A CCS transport system can be composed of several components as can be seen in the following figure:

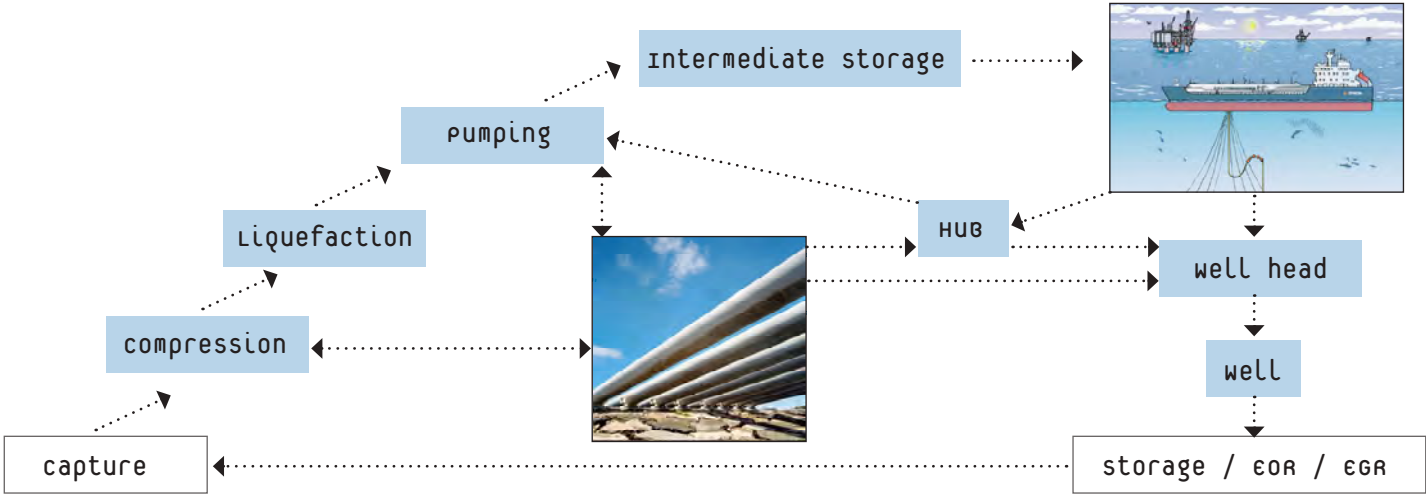


Figure 6: Components of a CCS transport system

The main issues in a CCS transport system are:

- **Interface control:** Maintaining a controlled flow across interfaces (e.g. from the pipeline through the wellhead into the well)
- **Transient behaviour:** Controlling the system in a transient state, e.g. during start-up or shut down and during maintenance.
- **Safety:** The properties of CO₂ differ from gases currently used in modelling tools (e.g. methane), making it difficult to predict CCS system behaviour. This is why experimental verification of models is important at this stage to be able to better predict the impact of residual components in the CO₂ stream.

The experience of Statoil comes from three industrial size facilities:

- 1 Sleipner with a pipeline of a few hundred metres and gas processing facilities from Aker amongst others. The gas stream is thought to be in dual phase mode (vapour/liquid).
- 2 In Salah with a pipeline of a few kilometres and gas facilities from Mitsubishi amongst others. The gas stream is in dense phase.
- 3 Snøhvit with a pipeline of 153 km and gas facilities from Linde amongst others. The gas stream is in the liquid phase.

Gelein recommended that governments should aim to avoid prescriptive CO₂ stream composition standards:

- The CO₂ stream composition should be optimised for project conditions (source, storage location and local conditions).
- Any additional steps required to make the CO₂ stream meet the standard will increase CAPEX/OPEX and could potentially introduce additional HSE hazards.

Currently, offshore storage in parts of Europe is regulated by the [OSPAR](http://www.ospar.org) convention. OSPAR is “the mechanism by which governments of the western coasts and catchments of Europe, together with the European Community” (from: www.ospar.org), cooperate to protect the marine environment of the North-East Atlantic”.







*
* It requires that the gas stream should consist “overwhelmingly of carbon dioxide” and
* “no waste or other matter may be added to the CO₂ stream for the purpose of disposing
* this waste or other matter underground.” According to Statoil, in its current form, the
* CO₂ requirements in the OSPAR convention provide good flexibility.
*

*
* In the discussion it was concluded that the degree of cooperation between the industry
* and the regulators in developing national regulations may vary from country to country.
* It was also concluded that the regulators in some countries are moving towards a greater
* degree of performance-based/goal-based regulations while the regulators in other
* countries have a more prescriptive system which sets specific demands for structures,
* technical equipment and operations in order to prevent accidents and hazard.
*

* * 5.1.1 Lessons Learned from the Statoil presentation by the * project members *

- * • The risks and challenges of CCS projects seem to be ‘business as usual’ for the oil
* and gas industries. The industry is used to working with high economic risk and high
* margin projects and have the competences, methods and (risk) management systems
* in place;
- * • The right language may help to improve public understanding:
* use “residual components” rather than “impurities” and “dense phase” rather
* than “super-critical phase.” ⁵
- * • The CCS projects connected to electricity power plants are facing an additional
* operational risk compared to the oil & gas industry, as CCS increases the risk of
* interrupted power production;
- * • CO₂ specification should not be restrictive (i.e. complying with regulatory requirements)
* during the demonstration phase;
 - * > Specifications should not result in cost increase if they do not reduce the HSE hazard
* or improve system availability;
 - * > The projects should be allowed to demonstrate that they can operate CCS safely;
 - * > Specifications should allow projects to demonstrate different materials and stream
* compositions.

* * 5.2 CO₂ Stream specifications *

*
* All projects shared their CO₂ stream specifications and considerations. The data are
* based on first estimates and assumptions and are likely to change. The raw data will not
* be shared outside the Network until the values are more certain.
*



*
* Specific remarks made by the participating projects:

* * **Hatfield** *

* The project will have a long pipeline (175 km) which puts emphasis on low CAPEX/OPEX
* for transport. Hatfield is aiming to develop a common CCS infrastructure for regional
* CO₂ emitters; therefore the pipeline should be capable of handling CO₂ streams from
* different capture technologies.
*

*

* ⁵ “Impure” does not mean it is contaminated and “Critical” refers to the physical state, not the system criticality.
*





ROAD

The basis for the ROAD specifications differs for the stages of the value chain. Capture is based on FEED study; Storage is still in the concept development phase. The CO₂ stream composition is based on avoiding hydrates and free water in the gas stream.

Compostilla

The Compostilla data are based on a first approach and a worst case scenario. As the project progresses, the specifications will be further defined.

Jämschwalde

The specifications are based on a technical frame concept for transportation. This is the basis for tender documentation. Studies show that the reservoir can handle the specification.

Porto Tolle

The specification is based on an initial estimate and is not yet good enough.

Belchatów

The specification is based on CCP FEED data.

All projects value sharing composition data on a regular basis (e.g. have an update every 3 months). New or changed values of the CO₂ stream composition will be shared, the rationale behind these changes will be discussed. This should be a recurring topic for the forthcoming Network meetings.

Some additions to the template were agreed:

- Include the sources of the numbers (e.g. model, calculation, standard, experiment)
- Include a column “other residuals”

Sharing CO₂ specifications with interested parties outside the Network is relevant for several reasons:

- **Health, safety and environment.** Sharing data will help to establish a better understanding of health, safety and environmental issues related to CO₂ transport.
- **Engineering.** While knowledge gaps exist on the impact of residual elements on corrosion and reservoir behaviour, sharing of specifications will help to develop engineering standards for specific aspects of CCS transport and storage.
- **Regulation.** Regulators will need to understand the minimum set of specifications for safe operation of CCS. Additionally they will need to understand how regulations should support the objectives related to the reduction of greenhouse gases and, more specifically, the deployment of CCS.



Currently projects are very reluctant to share their CO₂ specifications outside the Network. This is due to the high levels of uncertainty in the provisional estimates and, consequently, concerns that sharing information may lead to premature decisions by regulators. In contrast, the Hatfield project hopes to be the foundation for transport/storage infrastructure for several CO₂ emitters that potentially will use different capture technologies. Therefore, this project needs to convince the Government that flexibility in the permit is required to avoid some capture technologies being excluded *ex ante* from



becoming integrated into the infrastructure. Information on the CO₂ stream from the other projects using different capture technologies could thus be very helpful in this regard.

All projects agreed that the information should be released at some stage within the following parameters:

- Not too early as it may damage the interests of the projects;
- Not too late as it should help to accelerate CCS in general and will support the regulatory process;
- The responsibility to share knowledge is one of the Network obligations.

The projects agreed to have a discussion via the intranet on establishing criteria on when and how to share the composition data outside the network. The result will be discussed at the next Network meeting.

5.3 Risk Register

At the previous meeting the projects agreed to develop a CCS project risk register based on the risks identified by the individual Network members. DNV has compiled an initial version of the risk register. The projects have reviewed the initial draft and have submitted improvements and additions.

5.3.1 Introduction to the risk register

DNV provided a short introduction to the risk register and its use in risk management. A risk register lists identified risks and is used to manage those risks. It helps to communicate risks across project interfaces and between different disciplines. Since projects develop over time and their environments change, the risk register should be continuously updated through all project phases.

Developing and updating a risk register is a multi-disciplinary activity: the combined expertise of people from different backgrounds will make it easier to identify and understand the risk at hand. The CCS risk register produced by the Network can be used by the projects as a checklist: it may help projects to develop or improve their own project specific risk register. Failing to identify risks and their mitigating actions in time may have a significantly negative impact.

Risk can be external (the project is not able to influence the causes), or internal (the project can influence both causes and consequences). Risk can be defined as the effect of uncertainty on objectives. A risk assessment will identify the likelihood of specific events occurring and the impact of the consequences on the objectives. Risks can have an impact on a variety of objectives, such as finance, reputation and HSE.

The CCS risk register is generic for all projects. It describes the potential events and threats, their causes and the type of impact they can have on project objectives. The CCS risk register does not contain quantitative information on probability or consequences, as this will differ for each project: A listing of a risk in the risk register does not mean it has a high probability.





The CCS risk register will support the project team to develop their project risk register, which will be dedicated to their own project. This project risk register will help to identify project specific risks as a starting point for developing mitigating actions and contingency plans.

5.3.2 Risk register and CCS projects

ROAD, Hatfield and Bełchatów indicated that they have developed a risk register. Porto Tolle and Jämschwalde have started.

The projects are concerned about bringing the risk register into the public domain. This is not driven by the need to hide the risks from the public, but by concerns that non-experts may incorrectly interpret texts created by and for professional risk managers.

The projects agreed to define criteria on when and how the content of the risk register can be released outside the Network, without risking damage to any member project or CCS in general. A discussion on the intranet will help to define these criteria. The criteria will be discussed at the next Network meeting.

- A high-level analysis of the risk register was presented:
- 49 risks have been identified after combining similar risks;
 - Most risks relate to storage or the entire value chain;
 - Most risks have consequences on financial objectives. This is to be expected in the early development stages of the projects; The number of listed HSE related risks is limited.
 - Most risks are internal, although a significant number of external risks has also been identified. External risks are mostly related to obtaining external funding and on dependencies on policy makers and regulators.

ID	PHASE	RISK CATEGORY	RISK TITLE	CAUSE	CONSEQUENCE	OBJECTIVE			
						financial	HSE	system performance	reputation
3	Value chain	External	Lack of sufficient private funding	The project fails to obtain sufficient loans and other forms of private funding due to unclear risk picture.	The project maybe delayed of cancelled	x			
11	Value chain	External	Politacal influence on planning	Political agendas and timescales may affect the schedle ard affect differnt pars of the CCS chanin.	Projectdelays	x			

Figure 7. Partial view of the Risk Register







The way forward

The participants split up into three groups to discuss:

- What is further needed to make the risk register a useful tool for your project - type of content or format?
- How should we (the projects) contribute to achieve this - content, when, who and how to update?

The results of the discussions were presented to the group:

Content:

- Periodic updates of the risk register to help the individual projects to review their own risks;
- Addition of mitigating actions;
- Consolidation of the risks listed: some of the risks in the register can be merged or need to be split.

Format:

- Split the risks description into causes and consequences;
- Organise the risks in a better structure, e.g. by phase;
- Add an additional column for identifying types of stakeholders (e.g. R&D, regulators) who can help to mitigate the risk;
- Add an additional column for identifying the types of projects for which the risk does apply and why, e.g. has specific capture technology, uses offshore storage.

Validation:

- Other bodies like the Global CCS Institute should be asked to validate the risk register before release outside of the Network.

Contribution of the projects for further development:

- Each project should do an assessment to identify their high priority risks.
For common high priority risks (i.e. risks that have been identified by all or most of the projects as high priority) the mitigating actions should be identified in the Network;
- Addressing external risks through common or co-ordinated actions of the Network members, e.g. by using “The Voice of the Network”;
- Each project should provide updates based on newly identified risks, if any, on a three-monthly basis.

The projects agreed to:

- Contribute to regular updates of the risk register
- Identify their high priority risks based on an assessment of the risks in the risk register. DNV will provide guidelines.
- All projects agreed to return their input in a timely manner to allow DNV to process the results.





5.4 Review of the Risk Management theme in 2010

The projects were positive about the achievements in the risk management theme. Getting to know five other projects from five different countries takes time. Many participants had no prior experience with collaborating in an EC network. As the meetings progressed, the topics became more focussed and this increased the quality of the discussions. The results are valuable:

- CO₂ stream composition
- Risk register and a future focus on mitigating actions on common high priority risks

Ongoing work on these topics will set the agenda for 2011.

Assessment of the risk register by the individual projects will identify the high priority risks. A selection of high priority common risks will be addressed in the risk management theme in 2011. During these meetings the projects will share and discuss their mitigating actions. The key deliverables will be overviews of mitigating actions for common risks. The projects expect that some types of risk-mitigating actions can be supported by collective and co-ordinated actions of the Network (“the voice of the Network”).

The current way of working is appreciated. External speakers should be brought to the Network to bring new input. Speakers may come from other companies or academia with relevant expertise e.g. on topics like corrosion. The development of new ways of collaborating, such as using the intranet or organising webinars, is supported by the participants.

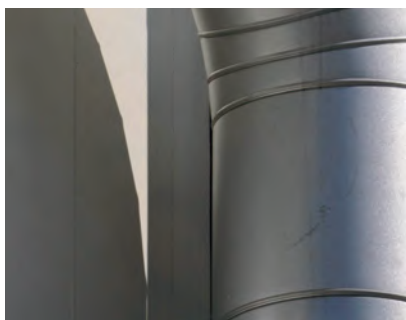
In the future a better connection and interactions with the other themes must be found. DNV has been asked to come up with ideas to support this.

6 Knowledge market

The second morning of the event focussed on identifying areas for sharing in 2011. In order to do so, participating projects were asked to create a timeline for the next 1.5 years, presenting major activities and milestones. The timelines helped to identify ‘knowledge pressure points’ in the period ahead and the results for each of the projects are shown in Appendix A.

The projects were then asked to list their top 3 lessons learned from the recent past, their top 3 knowledge needs for the future and the top 3 offers of knowledge that they believe will be developed within their project. After a short analysis by the Network team during a break, a list of common themes was presented to the meeting and a shortlist created. Following a voting round, in which each participant in the meeting could cast 2 votes for the themes, this list was prioritised, resulting in the following ranking:

- 1 CCS Directive/laws (14 votes)
- 2 Public perception/outreach (13 votes)
- 3 Storage location suitability (7 votes)
- 4 Permitting strategies (4 votes)







- * 5 CO₂ stream composition, including pilot results (2 votes)
- * 6 Capture process and design (2 votes)

* The results of the exercise will be used alongside the recommendations from the Advisory
* Forum and will be reviewed by the Network's Steering Committee to decide on the
* knowledge sharing agenda for 2011.

* 7 Concluding remarks

* After an online review of the Network's intranet by Eelco Kruizinga, the meeting was
* closed by Jan Panek of the European Commission. Jan noted that this Hamburg meeting
* has seen the highest level of participation so far and the discussions have been open and
* detailed. Thanking participants for their contributions to the workshop, he identified
* some goals for the Network:

- * • There is a need for stronger links between risk management and communication;
- * • Presentations will be made at the Berlin Forum meeting (18-19 October)
* and it is important that progress is reported;
- * • It is time for the Network to become the authoritative source of information
* on CCS demonstration in Europe;
- * • The messages from the Advisory Forum were clear - the Network should deliver
* on its recommendations and build respect;
- * • Requirement: regular and useful experience sharing;
- * • There are opportunities to work together with the Global CCS Institute to deliver
* knowledge-sharing objectives - Network members should look for synergies and
* avoid duplication;
- * • The knowledge-sharing process can become more project-driven; the EC will be
* less involved in the organisation of activities;
- * • It is up to the Steering Committee to deliver the Network's objectives in the most
* beneficial manner and to consider key topics, such as the interaction with smaller
* projects and how to disseminate progress results through public events.

* 8 Next meetings

* It was agreed that the next meetings are as follows:

- * • **16-17 February 2011**, hosted by Porto Tolle
- * • **7 June 2011**, hosted by Compostilla
- * • **16 September 2011** (Advisory Forum)
- * • **11-12 October 2011**, hosted by Bełchatów

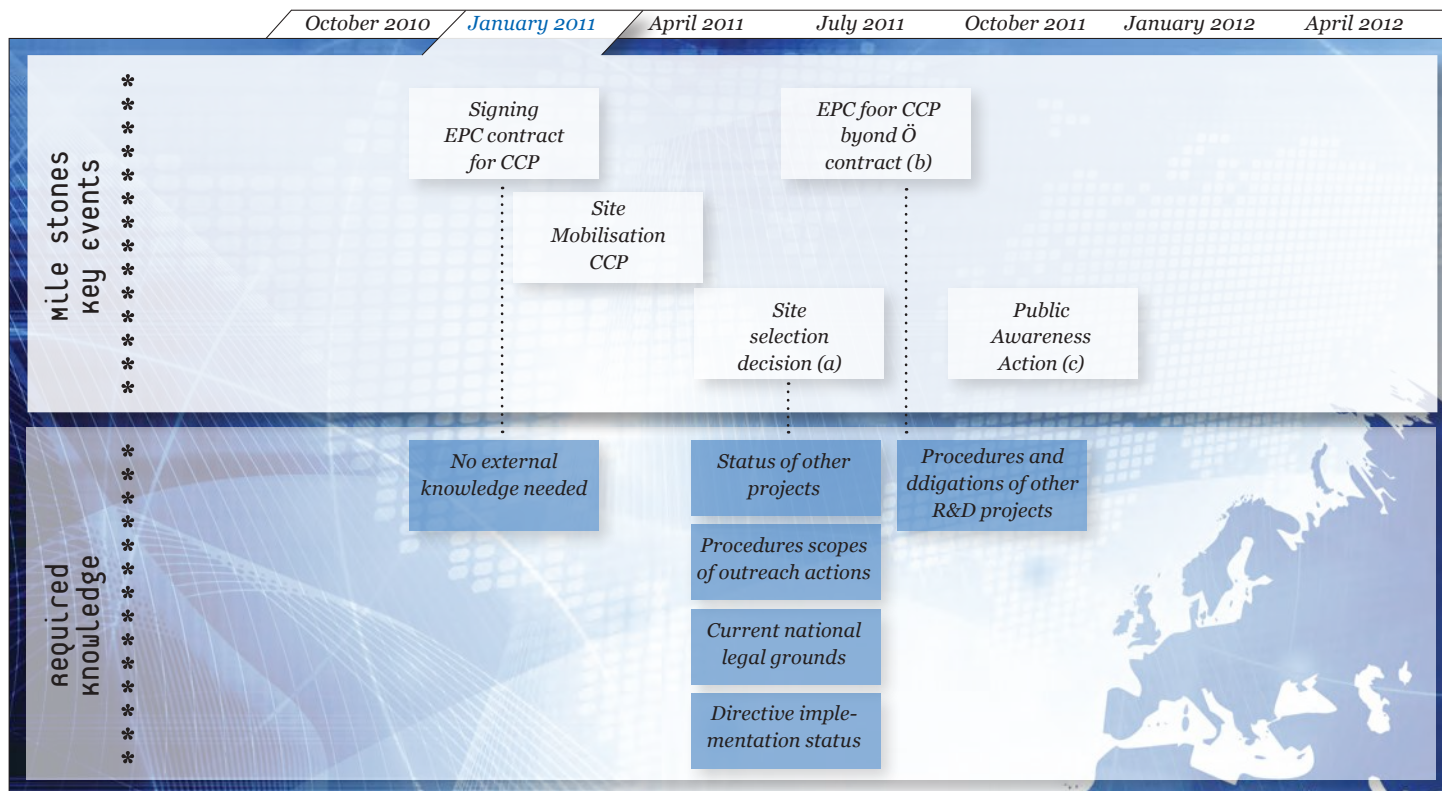




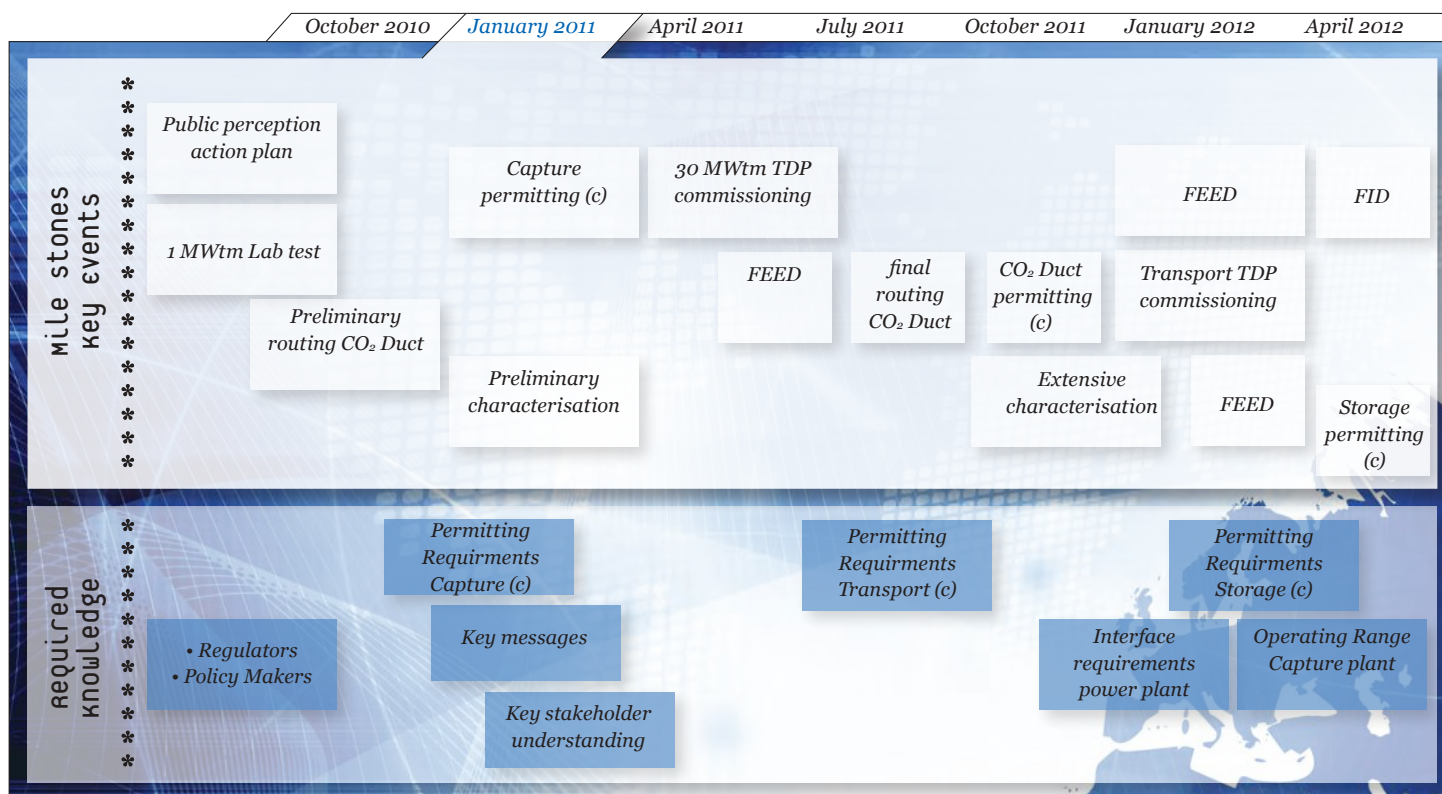


Timeline for Bełchatów

Appendix A. Project timelines

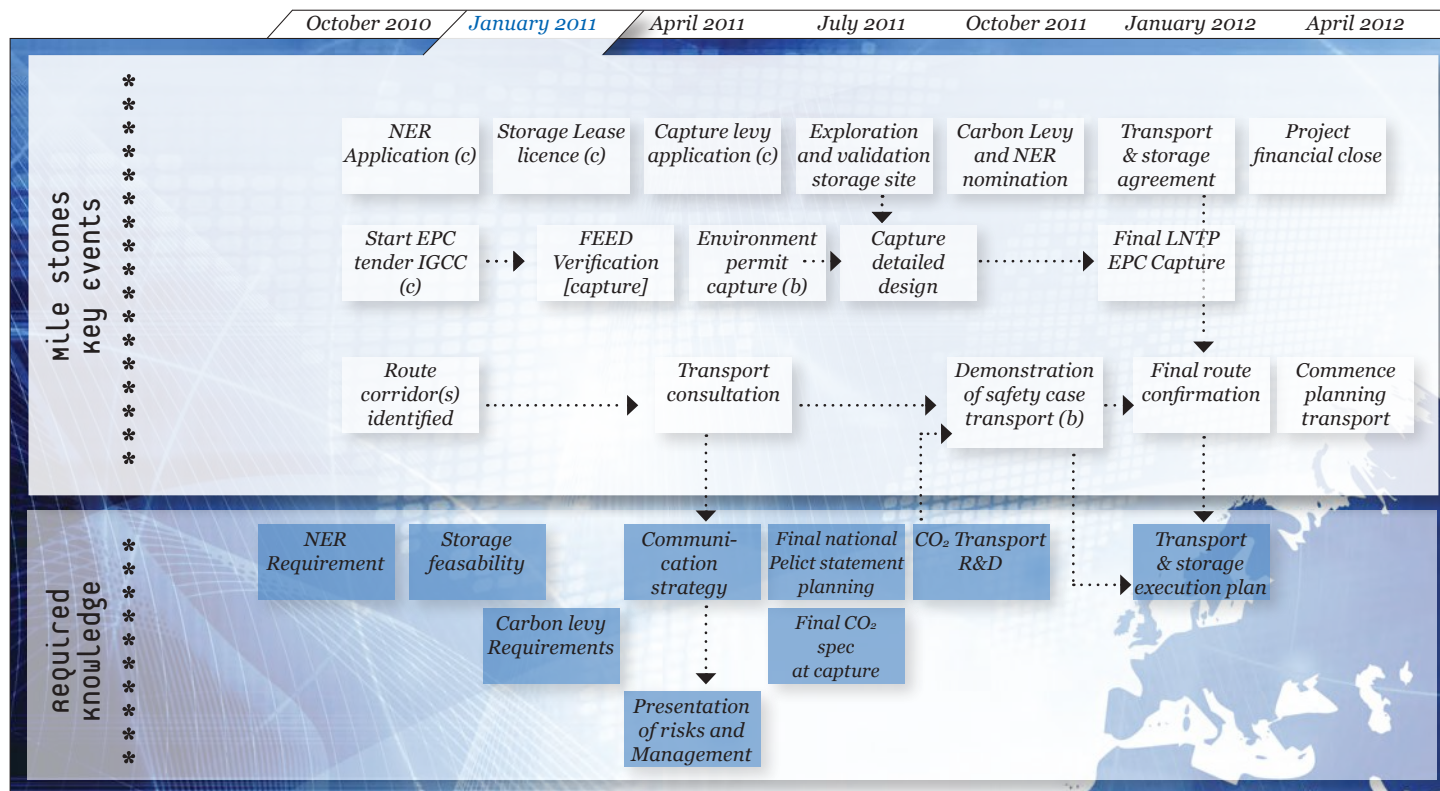


Timeline for Compostilla

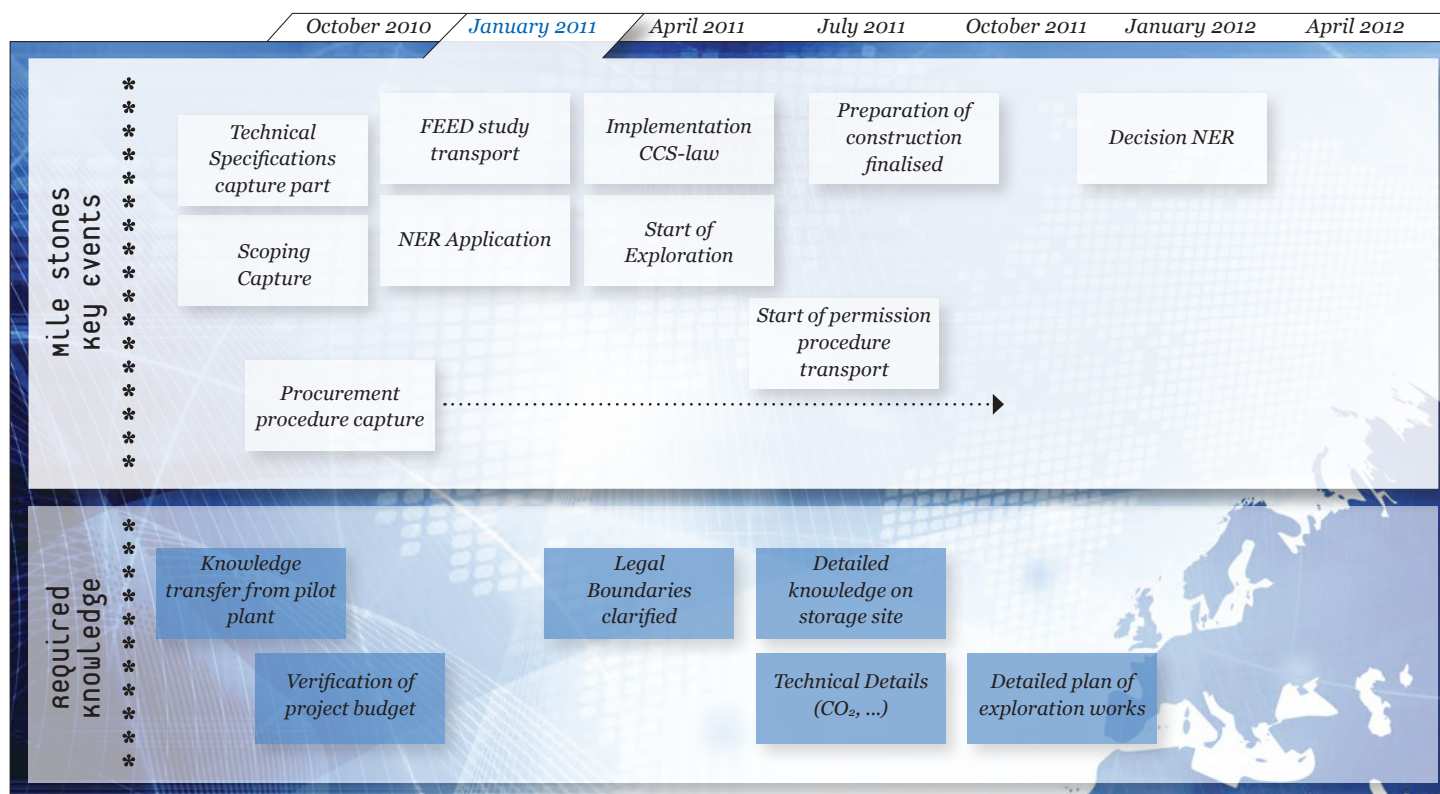


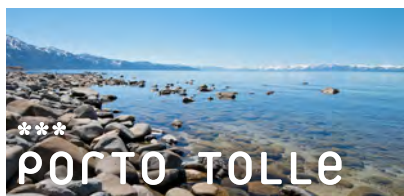


Timeline for Hatfield

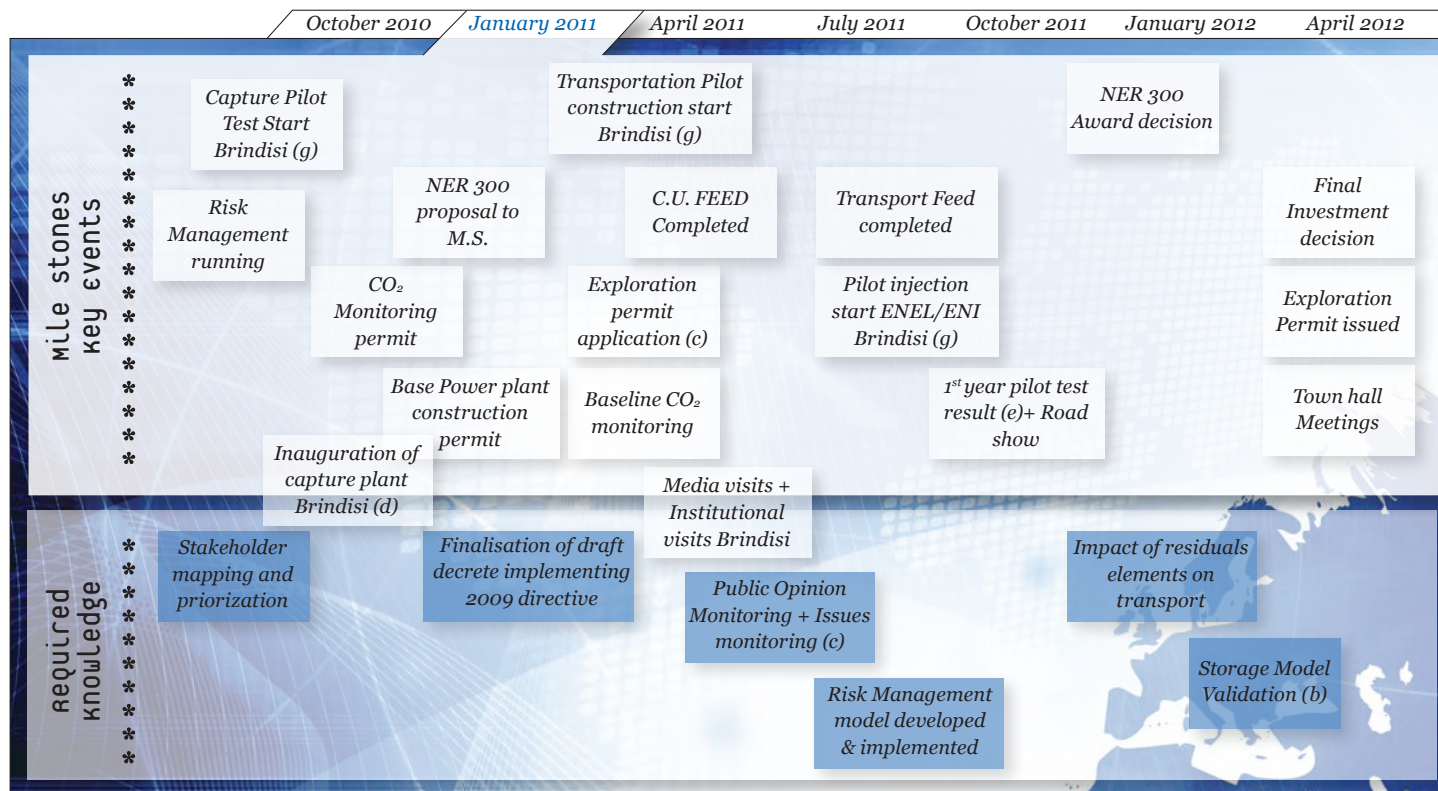


Timeline for Janschwalde





Timeline for Porto Tolle



Timeline for ROAD

