Permitting needs for CCS operations in the Netherlands

Prepared by: M. Mozaffarian (ECN), A. van Horssen (TNO), P. Lako (ECN), W. Meindertsma (TNO), B. Stortelder (KEMA)

Reviewed by M. Mozaffarian (ECN)

Approved by: J. Brouwer (CATO-2 Director)

1 Executive Summary

Introduction

The objective of CATO-2 WP4.2 is to identify best practices from permitting and certifying CCS activities at designated CCS sites in the Netherlands. Lessons learned from comparable CCS projects abroad will be taken into account as well. The underlying goal is to make the permitting process for the operators of CCS projects as efficient and smooth as possible. This goal requires a comprehensive overview of all aspects involved in the permitting process.

In this task, 4.2.02, many aspects of the permitting process have been handled. The results of this task are based on an extensive literature study and interviews with relevant parties, in- and outside the CATO-2 program.

Based on the data gathered from the location managers of the designated CCS sites within the previous activities of this work package, a number of different hypothetical CO_2 capture, transport and storage chains have been defined. Two general possibilities arise:

- The CCS chain starts either with a process that has pure CO_2 as a by-product, or with a CO_2 capture process. This capture process can be post-combustion CO_2 capture, or pre-combustion CO_2 capture, the latter in case of an Integrated Gasification Combined Cycle power plant (IGCC). The next step in the chain is the transport of CO_2 by pipeline in gaseous or supercritical state. The final step is the storage of CO_2 in an onshore or offshore reservoir, which is generally a depleted gas field.
- Alternatively, the CCS chain has no transport step, because the CO_2 is stored at the capture location. It starts either with a process with pure CO_2 as a by-product, or post-combustion CO_2 capture, followed by on-site CO_2 storage in an onshore saline aquifer.

For these operations, a step-by-step plan for the full permitting cycle for the different types of CCS projects has been prepared, including required permits, timing, and an indication of follow-up steps once all permits have been obtained.

Possibly, other chains may become relevant in the future: Oxy-fuel combustion (based on combustion with oxygen and flue gas recycling), CO_2 transport by ship and CO_2 storage in an offshore aquifer. The nature of these different chains results in different permit requirements.

In order to investigate the process of permitting of CCS in the Netherlands and to identify best practices, the initial literature study was supplemented with interviews with representatives of the following six companies or organizations, who are operators and stakeholders from the different aspects of the CCS chains:

- ROAD project (Rotterdam Opslag en Afvang Demonstratieproject);
- Ministry of EL&I (Economic Affairs, Agriculture, and Innovation) and Agentschap NL;
- NCEA (Netherlands Commission for Environmental Assessment);
- SodM (Staatstoezicht op de Mijnen, State Supervision of Mines);
- RWE/Essent.

Dutch legislation related to permitting procedure of CCS projects

CCS projects have to deal with Dutch legislation. The Dutch Act 'Wabo' (Wet algemene bepalingen omgevingsrecht) came into force in October 2010. It lays down the rules for granting an All-in-one Permit for Physical Aspects and enables members of the public and companies to use one transparent procedure to apply to one competent authority for permits for activities that impact on the physical environment. An overview of all permits in the Wabo is given in the report.

An Environmental Impact Assessment (a part of *Wet milieubeheer* –Act on Environmental Protection) is a procedural tool to assess and evaluate possible environmental effects of a proposed project and its reasonable alternatives, which can have significant effects on the natural and man-made environment. The EIA report describes amongst others the proposed initiative, the impact on the environment, and possible alternatives with a smaller negative impact.

A Strategic Environmental Assessment (SEA) is a procedural tool to include environmental impacts into strategic decision making by administrative bodies (strategic decisions in governmental policies, plans and programs). The EU SEA Directive was implemented in Dutch legislation (Wm) in 2006. The goal of the SEA is to obtain environmental information at moments that strategic choices/decisions have to be made. SEA is obligatory for statutory or compulsory administrative plans that form the framework for future decisions subject to EIA, or that require an appropriate assessment on the basis of the Dutch Nature Conservation Act.

In March 2010, the legal proposal to implement the EU CCS Directive in the Mining Act (Mijnbouwwet) was sent to parliament. The proposal was approved by the Dutch Senate late May 2011 and officially published June 6, 2011. It entered into force on September 10th, 2011. This transposition took place in a straightforward way. The Mining Act describes which obligations the applicant has to fulfil for CO_2 storage.

The Act on Spatial Planning, in Dutch referred to as the Wro (Wet ruimtelijke ordening) deals with spatial planning in the Netherlands on a national, provincial and municipal level. Part of the Wro is the 'integration plan' (in Dutch inpassingsplan). The inpassingsplan is used when a higher governmental body wants to 'overrule' an existing spatial plan by a lower governmental body. An inpassingsplan speeds up the legal procedures. In case of CCS, an inpassingsplan is required for pipeline construction, both onshore as well as offshore.

The RCR (Rijkscoördinatieregeling), an addition to the Wro, has been introduced to reduce the turnaround time for large-scale energy projects. This means that the coordination of these projects is at the discretion of the Minister of Economic affairs, Agriculture and Innovation (EL&I). In the RCR different decisions needed for a project are taken at the same time and in mutual agreement between the national, provincial, and municipal authorities (if applicable). The Minister of EL&I determines, after consultation of the relevant authorities, when all draft decisions and final decisions are taken. The RCR should be applied to the transport and storage steps of a CCS chain. A CO_2 capture unit, applied to an existing power plant, is not automatically part of the RCR, but it can be incorporated. Newly built power plants with CO_2 capture are automatically covered by the RCR, when the capacity is 500 MW or more.

The Crisis and Recovery Act, in Dutch referred to as the Crisis- en herstelwet, has become active at the end of March 2010. It is intended to speed up legal procedures of construction projects in order to improve the ailing Dutch economy. Among others, it affects the RCR and the EIA as well as the Act on Spatial Planning and as such the inpassingsplan.

International developments on permitting procedure

Based on an analysis of permitting issues of the CCS chain in a number regions all over the world, the installation of a CO_2 capture plant at a power plant could trigger additional permitting considerations through several new characteristics of the plant, including, *inter alia*:

- Changes in the overall thermal efficiency of the plant triggered by the energy penalty imposed by the CO_2 capture plant;
- Changes in the exhaust parameters of the plant, which can change the nature of the flue gas plume;
- Changes in the concentration of various compounds in the flue gases due to the absence of the dilution effect of CO_2, etc.

For CO_2 transport, fewer additional permitting considerations were found to be critical. Principally, considerations relate to:

- Higher pressures of CO_2 in dense phase in CO_2 pipelines relative to water or natural gas pipelines;
- Potential additional routing considerations to minimize any asphyxiation risks in the possible event of pipeline leakage.

For CO_2 storage sites, few comparable permitting regimes exist, and consequently a broad range of additional permitting considerations were identified. These include, *inter alia*:

- Permits for undertaking surveying activities for site selection and characterisation, such as well drilling and seismic surveying;
- Responsibility and liability issues associated with managing any leakage of CO_2 from storage reservoirs;
- Concerns over ecological and human health risks posed by any leakage of CO_2, both to the air directly above the storage reservoir and into adjacent soil and groundwater;
- Issues about liability and responsibility for undertaking long-term stewardship of storage sites to ensure that the CO_2 remains safely sequestered;
- There are also issues associated with licensing multiple users of underground resources at the same or overlapping sites and trans-boundary sub-surface migration of stored CO_2;
- How CO_2 storage sites can be monitored, how (quantified) data on any leakage can be determined and reported, and how this can be incorporated into the permitting process, etc.
- Additionally, the handling of large quantities of CO_2 at very high pressure on offshore platforms is expected to raise new safety issues, which will have to be addressed during the permitting process.

The general conclusion based on the analysis is that permitting systems for CO_2 capture and transport require little modification, but major developments are needed for the subsurface

element. Furthermore, there are significant issues, which already have to be addressed at the planning stage.

The following recommendations with regard to CO_2 storage in the timeframe 2009-2013 have been made (and many are studied at the moment this report is issued):

- Develop national and global atlases of CO_2 storage site and capacity;
- Determine allowable impurities in the CO_2 injected for storage;
- Establish standardized methodologies for estimating site-specific and worldwide storage capacity;
- Successfully complete pilot field tests for validation of injection and Measurement, Monitoring and Verification (MMV);
- Establish methodologies and models for predicting the fate and effects of injected CO_2 and for risk, including wellbore integrity assessment;
- Initiate large-scale field tests for injection and MMV;
- Establish industry best practices guidelines for reservoir (pre) selection, CO_2 injection, storage, and MMV;
- Develop remediation measures, including remediation techniques (foam/ gel etc.) to maintain and/or restore sealing efficiency.

Another important aspect in international developments on permitting procedures of CCS is the issues related to cross border permitting processes. It is expected that in the future, the development of large-scale CCS network will require cooperation between different countries. This could lead to complicated international permitting procedures, for instance when one country stores the CO_2 of another country. Research into this topic is still ongoing.

Common practice in permitting CCS projects in the Netherlands

The results of the interviews with the stakeholders are presented including an overview of the required permits and the related planning for large-scale CCS demonstration projects.

In case of a CCS initiative a final investment decision (FID) is followed by a detailed design. The first step in an EIA procedure is the publication of a Start note (or plan EIA report). Before an application for a permit can be filed, in most cases (if not all) an Environmental Impact Assessment (EIA) for a whole CCS chain is needed (Project EIA report). When the EIA is completed the initiator can apply for the necessary permits, coordinated by the Ministry of EL&I. When the final permits are available there is only one objection and appeal possibility at the Council of State (in Dutch RvS, Raad van State). When the RvS upholds the permits, these become irrevocable.

The permit in the framework of the Wabo is relatively time consuming because it is a central permit, involving advice from a number of experts. Whether the Wabo will actually reduce the time needed for permits in case of a CCS project remains to be seen.

With respect to the total CO_2 chain from capture to storage it needs to be proven that there are no significant effects on nature (Natura 2000 areas). The Nature Conservation Act appears to have (had) a relatively large impact on permits for coal-fired power plants bordering the Waddenzee,

but also for new power plants located at the Maasvlakte. The Nature Conservation Act could also cause difficulties for CCS projects, as there is still limited experience with this act.

One of the steps in the procedure for a CO_2 storage license is the assessment of the storage operator by EL&I, SodM and TNO (time required: a few months). The main criteria are effectiveness and efficiency. However, there is still hardly any experience with the storage license.

For an existing installation that is to be equipped with CO_2 capture, the applicant needs a 'Veranderingsvergunning' (Licence of Change) in the framework of the Act on environmental protection (Wm), since the permit for the existing power plant is no longer valid. This is mainly caused by changes in emissions and energy use which impair the prevalent permit. For these cases the Province is the relevant authority.

In the case of offshore CO_2 storage the number of permits needed for the whole CCS chain will be smaller than for onshore CO_2 storage. For offshore storage (outside the 12 miles zone), the Wabo doesn't apply. There is also no need to amend the Zoning plan (Bestemmingsplan). What is more, there is only one Competent Authority, i.e. the government (municipalities and provinces do not have any mandate on the Dutch continental shelf). Outside the 12 miles zone, the Mining Act applies, next to regulation with regard to shipping (Scheepvaartverkeerswet), the Water Act and international acts or regulations. When CO_2 is stored within the 12 miles zone, several permits or exemptions from acts relevant for onshore CO_2 storage may apply. Examples are exemptions needed from the Flora and Fauna Act, the Act on Nature Conservation, etc. (in case of the Flora and Fauna Act, the operator of a CCS or CO_2 storage project does not need a permit, but an exemption).

The following different parties are involved in the permitting procedure of the CCS projects:

- For CO_2 transport and storage, the Ministry of EL&I is the coordinating authority. The Ministry also takes care of the 'Rijkscoördinatieregeling'.
- Generally the Provinces are responsible for the Act of Environmental Protection and as such involved in several of the permits for CO_2 capture.
- Municipalities are involved in the permitting process on a more local scale, such as those for felling trees, construction activities and noise disturbance.
- In the case of CO_2 storage in an empty gas field the Minister of EL&I is the competent authority (because of Wabo) for the "omgevingsvergunnig" related to mining activities at the storage location.
- The Netherlands Commission for Environmental Assessment advises on the contents of the required EIAs, and on the quality of the EIA when it has been published.
- The TNO Advisory group of Economic Affairs advises the Ministry of EL&I on the geotechnical aspects of the CCS project. Subsequently, the Mining Council (Mijnraad in Dutch), taking this advice into account, provides advice to the Minister of EL&I on whether or not to grant the permit.
- The State Supervision of Mines supervises the correct implementation of relevant legislation regarding CO_2 storage. It is also involved in supervising legislation regarding the safety of gas transport networks and it makes sure that these laws are followed correctly. In addition, it advises the ministry of EL&I on technical issues in permitting procedures for CCS.

- Finally, the European Commission is entitled to overview the implementation of the CCS Directive with respect to the initial stage of CO_2 storage.

The following list shows some problems which can affect, among other things, the permitting procedure:

- Change of political direction (Government, Province, Municipality);
- Loss of public support for CCS and in particular for CO_2 storage;
- Loss of support from competent authority (terms are tight, a lot of information is needed that is 'Raad van State proof', harmonization of permit applications);
- Lack of coordination between the initiators of the CCS project and the RCR coordinator.

Some interviewees made mention of difficulties encountered in the Barendrecht CCS project because the municipality of Barendrecht was opposed to this project from the outset. Since the national government was assumed to coordinate the CCS project, this 'intergovernmental' conflict with the municipality turned out to be highly challenging. It is desirable that in the future better opportunities for cooperation will emerge.

For the application of a permit for CO_2 capture, no specific problems have been reported by the relevant respondents. For CO_2 storage, some interviewees contended that it may be rather complicated to provide evidence that the storage of CO_2 is safe and permanent, which is required by the Mining Act (implementation of the EU CCS Directive). Also, CO_2 emission permits for CO_2 transport and CO_2 storage (ETS) may incur difficulties. A company interested in CO_2 storage will generally apply for a permit to store CO_2 in a depleted gas reservoir. However, if it would apply for CO_2 storage in a saline aquifer the burden to prove that the CO_2 is stored safely and permanently will probably be much larger than in case of a depleted gas field. Also, it may be really difficult to quantify how much CO_2 is still underground and how much has escaped to the atmosphere in case of CO_2 leakage. It is, however, expected that many of these problems would probably disappear by frequent contact with the competent authorities, as here the element of interpretation of the law would play an important role.

The monitoring of the total CCS chain for ETS will be a challenge. For an emission license emitters have to hand in a monitoring plan and are obliged to make a yearly emission report. When somewhere in the chain the CO_2 is handed over to another operator (for instance from the operator of the capture plant to the operator for transport and storage), all operators involved in the chain have to monitor and report their emissions for ETS.

There is room for interpretation of the EU CCS Directive by the member states. With respect to the Mining Act (Mijnbouwwet) the following aspects are not totally clear yet:

- Liability (not regulated by the CCS Directive);
- Financial security;
- Cost of storage transfer to the authorities (The last two items are dealt with in the Guidance Document 4 of the EU CCS Directive).

Some interviewees have noted, that the Mining Act does not require an operator of a gas field to make provisions to mothball specific facilities for future CO_2 storage. This is not feasible as the

national government as a matter of principle does not introduce additional national rules when implementing EU Directives.

The time required to get the permits for a CCS project is comparable with a normal scheme for a large power plant. Formal procedures are rather straightforward within the RCR, but no absolute guarantee exists that timelines will be met. There is only limited experience with permits for CCS projects. In general, the RCR may serve as an umbrella for the permits and exemptions from acts or regulations that are needed. However, it is not evident whether the RCR will significantly reduce the period of time needed to obtain the permits of interest. This will only become apparent in the future.

It has also been noted that the current articles in the Mining Act related to the EU CCS Directive do not distinguish between CO_2 storage in a depleted gas field or storage in a saline aquifer. However, the different circumstances of CO_2 storage for these two options require a different legislation and hence the need for a clear distinction in the Mining Act.

Due to the shift in focus in the Netherlands to offshore CO_2 storage, ship transport has to get more attention. Ship transport may offer a cost-effective alternative to CO_2 transport by pipelines. Especially for smaller offshore fields, where no pipeline infrastructure is available yet, ship transport could be an interesting option.

Conclusions and recommendations

An overview of the required permits and the related planning for large-scale CCS demonstration projects has been provided. This overview has been made by Stichting Borg and the Ministry of EL&I, and is based on the required permits for the onshore CCS project in Barendrecht and the ROAD project with offshore CO_2 storage.

Based on the results achieved in this study, the following conclusions and recommendations can be made:

- A Best Practice document on permitting can be helpful for new initiatives for CCS projects.
- It would be very helpful for the permitting process when CATO would make neutral information available to CCS stakeholders on all aspects of carbon capture and storage.
- The time required to get the permits for a CCS project is comparable with a normal scheme for a large power plant. Formal procedures are rather straightforward within the RCR, but no absolute guarantee that timelines will be met. This will only become apparent in the future.
- The permit in the framework of the Wabo is relatively time consuming because it is a central permit, involving advice from a number of experts. Whether the Wabo will actually reduce the time needed for permits in case of a CCS project will have to be demonstrated.
- An important potential problem in the permitting process is the lack of coordination between the initiators of the CCS project and the RCR coordinator. From the onset of the project, during the preparation phase, cooperation between the two parties should be close, in order to streamline the permitting process and prevent misunderstandings along the way.
- Some interviewees made mention of difficulties encountered in the Barendrecht CCS project because the municipality of Barendrecht was opposed to this project from the

outset. Since the national government was assumed to coordinate the CCS project, this 'intergovernmental' conflict with the municipality turned out to be highly challenging. It is desirable that in the future better opportunities for cooperation will emerge. The Rijkscoördinatieregeling and Crisis and Recovery Act are expected to provide improvements in this respect.

- Current articles in the Mining Act related to the EU CCS Directive do not distinguish between CO_2 storage in a depleted gas field and storage in a saline aquifer. However, the different circumstances of CO_2 storage for these two options require a different legislation and hence the need for a clear distinction in the Mining Act.
- Due to the shift in focus in the Netherlands to offshore CO_2 storage, ship transport has to get more attention. Ship transport may offer a cost-effective alternative to CO_2 transport by pipelines. Especially for smaller offshore fields, where no pipeline infrastructure is available yet, ship transport could be an interesting option.

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2 Applicable/Reference documents and Abbreviations

2.1 Applicable Documents

(Applicable Documents, including their version, are documents that are the "legal" basis to the work performed)

	Title	Doc nr	Version
~~AD-01a~~	~~Beschikking (Subsidieverlening CATO-2 programma verplichtingnummer 1-6843~~	~~ET/ED/9078040~~	~~2009.07.09~~
~~AD-01b~~	~~Wijzigingsaanvraag op subsidieverlening CATO-2 programma verplichtingennr. 1-6843~~	~~CCS/10066253~~	~~2010.05.11~~
~~AD-01c~~	~~Aanvraag uitstel CATO-2a verplichtingennr. 1-6843~~	~~ETM/10128722~~	~~2010.09.02~~
AD-01d	Toezegging CATO-2b	FES10036GXDU	2010.08.05
AD-01f	Besluit wijziging project CATO2b	FES1003AQ1FU	2010.09.21
AD-02a	Consortium Agreement	CATO-2-CA	2009.09.07
AD-02b	CATO-2 Consortium Agreement	CATO-2-CA	2010.09.09
~~AD-03a~~	~~Program Plan 2009~~	~~CATO2-WP0.A-D.03~~	~~2009.09.17~~
~~AD-03b~~	~~Program Plan 2010~~	~~CATO2-WP0.A-D.03~~	~~2010.09.30~~
AD-03c	Program Plan 2011	CATO2-WP0.A-D.03	2010.12.07

2.2 Reference Documents

(Reference Documents are referred to in the document)

	Title	Doc nr	Issue/version	Date

2.3 Abbreviations

AMESCO	Algemene Effecten Studie CO_2 Opslag
AmvB	Algemene maatregel van bestuur
APV	Algemene plaatselijke verordening
CA	Competent Authority
CCS	Carbon Capture and Storage
CSLF	Carbon Sequestration Leadership Forum
DPSIR	Drivers, Pressures, States, Impacts and Responses
EIA	Environmental Impact Assessment
EL&I	Ministerie van Economische Zaken, Landbouw en Innovatie
ETS	EU Emissions Trading System
FID	Final Investment Decision
GHG	Greenhouse gas
IGCC	Integrated Gasification Combined Cycle
IPPC	Integrated Pollution Prevention and Control
LNG	Liquid Natural Gas
m.e.r.	milieueffectrapportage
MER	Milieu Effect Rapport
MMV	Measurement, Monitoring and Verification
NCEA	Netherlands Commission for Environmental Assessment
PMV	Provinciale Milieuverordening
RCR	Rijkscoördinatieregeling
ROAD	Rotterdam Opslag en Afvang Demonstratieproject
SEA	Strategic Environmental Assessment
SodM	Staatstoezicht op de mijnen
Wabo	Wet algemene bepalingen omgevingsrecht
Wm	Wet milieubeheer
Wro	Wet ruimtelijke ordening
Wvo	Wet verontreiniging oppervlaktewateren

3 Introduction

3.1 Objective

The objective of CATO-2 WP4.2 is to identify best practices from permitting and certifying CCS activities at designated CCS sites in the Netherlands[1] (offshore as well as onshore urban and rural areas)[2]. Lessons learned from comparable CCS projects abroad will be taken into account as well. The underlying goal is to make the permitting process for the operators of CCS projects as efficient and smooth as possible. This goal requires a comprehensive overview of all aspects involved in the permitting process. In this task, 4.2.02, many aspects of the permitting process have been handled.

Based on the data gathered from the location managers of the designated CCS sites, a number of different hypothetical CO_2 capture, transport and storage operations have been defined. For these operations, a step-by-step plan for the full permitting cycle for the different types of CCS projects has been prepared, including required permits, timing, and an indication of follow-up steps once all permits have been obtained. In this deliverable a concise overview of the results for task 4.2.02 so far is given. The results are based on an extensive literature study and interviews with relevant parties, in- and outside the CATO-2 program.

3.2 Reference CCS chains

For the Netherlands, a number of reference CCS chains have been defined. Figure 3.1 shows the reference CCS chains which are considered in the framework of this study. These chains provide insight into the different processes involved in a CCS operation and can be used to provide a framework for the types of permits which are required.

The CCS chain starts either with a process that has pure CO_2 as a by-product or with a CO_2 capture process. This capture process can be post-combustion CO_2 capture, or pre-combustion CO_2 capture, the latter in case of an Integrated Gasification Combined Cycle power plant (IGCC). The next step in the chain is the transport of CO_2 by pipeline in gaseous or supercritical state. The final step is the storage of CO_2 in an onshore or offshore reservoir, which is generally a depleted gas field.

Alternatively, the CCS chain has no transport step, because the CO_2 is stored at the capture location. It starts with a process with pure CO_2 as a by-product or post-combustion CO_2 capture, followed by on-site CO_2 storage in an onshore saline aquifer.

Possibly, other chains may become relevant in the future: Oxy-fuel combustion (based on combustion with oxygen and flue gas recycling), CO_2 transport by ship and CO_2 storage in an offshore aquifer. The nature of these different chains results in different permit requirements.

[1] For a detailed description of these sites see: (Mozaffarian *et al., 2010*)

[2] Since the writing of this report, reality has caught up with onshore CO_2 storage in the Netherlands. On the 4th of November 2010, it was announced that the CO_2 demonstration project in Barendrecht would be cancelled. In February 2011, the Dutch minister of Economic Affairs, Agriculture and Innovation (EL&I), announced that onshore CO_2 storage will not be spatially allowed in the foreseeable future.

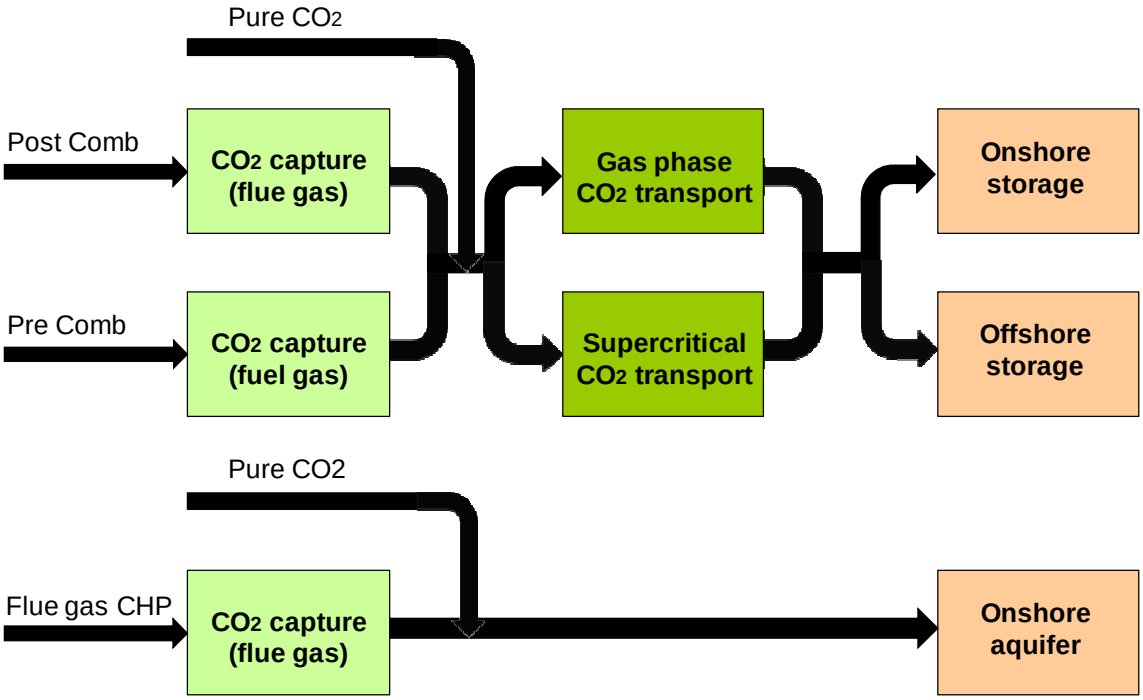

Figure 3.1 ***CCS chains considered in this study; the top chains including and the bottom chains excluding transport***

3.3 Questions related to the permitting procedure

In order to investigate the process of permitting of CCS in the Netherlands and to identify best practices, the initial literature study was supplemented with interviews with operators and stakeholders from the different aspects of the CCS chains. For these interviews, the following research questions have been formulated:

- What is the procedure from CCS initiative to irrevocable permits (paragraph 6.1)?
- Which are the relevant Acts and permits for a CCS project (Chapter 4)?
- What is the procedure for an Environmental Impact Assessment (EIA) (paragraph 4.2)?
- Which procedure has to be followed in case of retrofitting of an existing power plant with CCS (paragraph 6.2)?
- What are the main differences in permits for onshore and offshore CO_2 storage (paragraph 6.3)?
- Which permits are more difficult to obtain and why (paragraph 6.4)?
- What is the procedure to obtain a permit, the responsible authority, and the time needed (paragraph 6.1 and 6.9)?
- Which parties are involved in the permitting process (paragraph 6.5)? How do different owners or future owners of gas production or CO_2 storage licenses cooperate? Which kind of information has to be provided about the geologic characteristics (subsurface) (paragraph 6.1 and 6.7)?

- What kind of problems are (to be) encountered in the permitting process (paragraph 6.6)?
- Has the EU CCS Directive been transposed in a sufficiently transparent way (into the Mining Act) (paragraph 6.7)?
- Are there any additional requirements to be expected for the future permitting process (paragraph 6.8)?
- How much time does the permitting process for a CCS chain require compared to other options such as the permitting process for a (coal-fired) power plant (paragraph 6.9)?
- Are there any suggestions for improvement in the permitting process? Is there any trend observed towards a better method/approach (paragraph 6.10)?
- What can parties involved in CATO-2 contribute to improve the process of permitting (paragraph 6.11)?

3.4 Companies, ministries and institutions interviewed

The questions of the preceding paragraph have been put forward in interviews with representatives of the following six companies or organizations:

- ROAD project (Rotterdam Opslag en Afvang Demonstratieproject);
- Ministry of EL&I (Economic Affairs, Agriculture, and Innovation) and Agentschap NL;
- NCEA (Netherlands Commission for Environmental Assessment);
- SodM (Staatstoezicht op de Mijnen, State Supervision of Mines);
- RWE/Essent.

3.5 Contents of the report

Chapter 4 provides the backgrounds in Dutch legislation related to permitting procedure of CCS projects. International developments on permitting procedures are presented in chapter 5. Chapter 6 provides a synopsis of the most important permits required for CCS and addresses the most pressing issues based on the questions from the interviews. Chapter 7 shows the way forward; how do we proceed from here to address the issues mentioned in the previous chapters. Finally, the conclusions and recommendations are presented in chapter 8.

4 Backgrounds in Dutch legislation related to permitting procedure of CCS projects

CCS projects are subject to a range of Dutch legislative acts and procedures. The following paragraphs show some basic background information on relevant Dutch legislation issues. The issues that will be elaborated in more detail are the Act 'Wabo' (Wet algemene bepalingen omgevingsrecht), the environmental impact assessments (part of the Wm - Act on Environmental Protection), the implementation of the EU CCS directive in the Dutch Mining Act, the Act on Spatial Planning (Wro, Wet ruimtelijke ordening), and the Crisis and Recovery Act. Next to these topics the RCR (Rijkscoördinatieregeling) will be discussed as a coordination tool for an efficient permitting procedure. In Figure 4.1 a schematic overview of the relation between the issues is given.

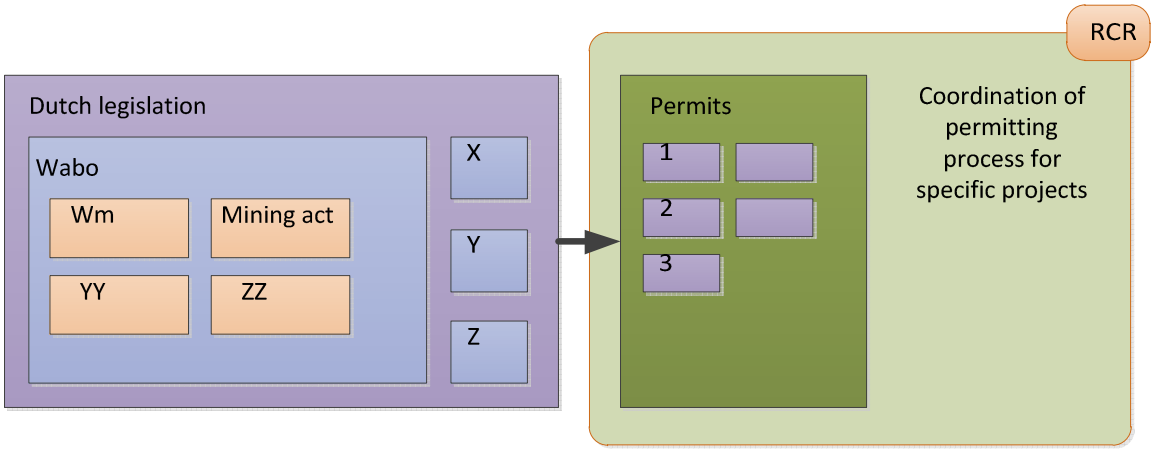

Figure 4.1 ***Schematic overview of Dutch legislation relevant to the permitting procedure for CCS***

4.1 Wabo

The Dutch Act 'Wabo' entered into force on October 1, 2010. The act lays down the rules for granting an All-in-one Permit for Physical Aspects and enables members of the public and companies to use one transparent procedure to apply to one competent authority for permits for activities that impact on the physical environment. The Wabo includes a chapter on financial security, which is more or less mirrored by a clause on financial security in the Mining Act in case of CO_2 storage. The new Act has replaced around 25 separate permits for such matters as construction, demolition, spatial planning, listed buildings and the environment by a single one-stop-shop permit covering all activities.

An overview of all permits in the Wabo is given in Appendix A.

4.2 Environmental Impact Assessment and Strategic Environmental Assessment

EIA

An Environmental Impact Assessment (EIA) is a procedural tool to assess and evaluate possible environmental effects of a proposed project and its reasonable alternatives, which can have significant effects on the natural and man-made environment. The aim of the EIA is to ensure that environmental information is incorporated in a sensible and transparent decision making process. The EIA was implemented in Dutch legislation (Wet milieubeheer) in 1987. Thresholds for activities are used to ensure that an EIA is obligatory for those activities which may have a considerable impact on the environment. The EIA report describes amongst others the proposed initiative, the impact on the environment, and possible alternatives with a smaller negative impact. Whether (one of) these alternatives are preferable depends *inter alia* on their cost/benefit ratio.

SEA[3]
A Strategic Environmental Assessment (SEA) is a procedural tool to include environmental impacts into strategic decision making by administrative bodies (strategic decisions in governmental policies, plans and programs). The EU SEA Directive was implemented in Dutch legislation (Wet milieubeheer) in 2006. The goal of the SEA is to obtain environmental information at moments that strategic choices/decisions have to be made. For the Netherlands this means that the SEA is obligatory for plans and projects that create legal conditions for future EIA-projects, and for plans that cause possible negative effects on European protected Nature 2000-area's. As is the case in the EU Directive, SEA is obligatory for statutory or compulsory administrative plans:

- that form the framework for future decisions subject to EIA or;
- that require an appropriate assessment on the basis of the Dutch Nature Conservation Act.

NCEA
In the Netherlands, the NCEA (Netherlands Commission for Environmental Assessment) is an independent organisation which safeguards the quality of environmental information that is required for political decision making. The NCEA does not advise on whether projects or plans are to be realized. The NCEA can advise at the start of an EIA process on the contents of the study and review the quality of the published report. (www.eia.nl)

4.3 Mining act - transposition of the EU CCS Directive into the Dutch legislation

The EU CCS Directive is officially called 'Directive 2009/31/EC of the European Parliament and of the Council on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006' of April 23, 2009. The EU CCS Directive has to be transposed into national legislation in order to become effective. In 2011, four 'Guidance documents' for transposition of the CCS Directive in national legislation were published. These guidance documents are denoted in the Chapter 'References' as 'EC, 2011a, b, c, and d'.

In March 2010, the legal proposal to implement the EU CCS Directive in the Mining Act (Mijnbouwwet) was sent to parliament. Appendix B shows the obligations for CO_2 storage based

[3] Koornneef *et al*. (2008a)

on the transposition in the Mining Act. Appendix C gives a synopsis of the aforementioned guidance documents of Directive 2009/31/EC. The legal proposal was approved by the Dutch Senate late May 2011 and officially published June 6, 2011. It entered into force on September 10th, 2011.

In an article submitted in 2009, Roggenkamp *et al.* (2010) give a view of transposition of the Directive in the Netherlands. As the article was written in 2009, before the transposition of the Directive in the Mining Act, some of the findings may have been superseded. Their main findings are:

- CO_2 capture activities will be subject to an environmental impact assessment. Pipelines for the transport of CO_2 with a diameter of 800 mm and a length of minimal 40 kilometres will also be subject to an environmental impact assessment.
- The CO_2 capture installation has to comply with the IPPC (Integrated Pollution Prevention and Control) Directive. This means that best available techniques have to be employed. In addition, combustion plants should be 'capture-ready', e.g. suitable for CCS retrofit in the nearby future.
- The captured CO_2 stream should consist largely of CO_2. CO_2 intended to be stored according to the CCS guidelines will not be considered as a waste product.
- The exploration for potential storage sites as well as the actual storage process will be subject to a permitting process. If exploration shows that storage of CO_2 is feasible for a certain location, the holder of the exploration permit will have precedence for a storage license. However, if current holders of a production license would like to apply for an exploration license, they have to hand in their production license and apply for the storage license in competition with other interested parties. In addition, storage permits issued by member states are obliged to be checked by the European Commission.
- The EU has specifically stated that member states should facilitate cross-boundary CCS deployment. This includes providing access to the transport network and storage locations for third parties based on transparent and non-discriminatory principles. A point of concern is the fact that the EU Directive can be implemented in different ways among the individual member states.

The publication "CO_2 transport- en opslagstrategie" by EBN and Gasunie (2010) is an advice of EBN and Gasunie on a CO_2 transport and storage strategy. Production licenses for most of the oil and gas fields in the Netherlands may be extended as long as economic gas or oil production is feasible. This may pose an obstacle to parties involved in CO_2 storage. The study gives suggestions to remedy this issue.

4.4 The Act on Spatial Planning

The Act on Spatial Planning, in Dutch referred to as the Wro (Wet ruimtelijke ordening), deals with spatial planning in the Netherlands on a national, provincial and municipal level. Part of the Wro is the 'integration plan' (in Dutch inpassingsplan). The inpassingsplan is used when a higher governmental body wants to 'overrule' an existing spatial plan by a lower governmental body. It can be issued if there are clear indications of provincial or national interests, such as in the construction of military bases, nuclear power plants, large infrastructural projects and for instance

CCS installations. An inpassingsplan speeds up the legal procedures. In case of CCS, an inpassingsplan is required for pipeline construction, both onshore as well as offshore.

4.5 Rijkscoördinatieregeling (RCR)

The turnaround time for the construction of gas pipelines, wind farms, powers stations and other large energy projects in the Netherlands was very long. Several municipalities were involved and there were several moments of appeal. To reduce the turnaround time the 'RCR' for large-scale energy projects was introduced as part of the Act on Spatial Planning. This means that the coordination of these projects lies with the Minister of Economic affairs, Agriculture and Innovation (EL&I). In the 'RCR' different decisions needed for a project are taken at the same time and in mutual agreement between the national, provincial, and municipal authorities (if applicable).

The initiator of a project remains responsible for a good project preparation and obtaining all permits and exemptions. Licenses remain the responsibility of the authorities as they were without the RCR. However, the coordinating minister determines, after consultation with the relevant authorities, when all draft decisions and final decisions are taken. All logistical tasks of the coordinating minister are carried out by the Energy Projects Agency with the concerned parties.

The RCR is applicable to:

- Power plants with a capacity of 500 MW or more;
- Wind farms with a capacity of 100 MW or more;
- Other renewable power plants with a capacity of 50 MW or more;
- Extension of the High Voltage grid, with a voltage of 220 kV and higher;
- Extension of the gas transport grid, with a pipeline with pressure of 40 bar or more and a diameter of 45.7 cm or more;
- Mining works for the storage of materials and associated pipelines;
- Construction or extension of an LNG (Liquid Natural Gas) degasification plant with a capacity of at least 4 billion m^3 per year.

The RCR should be applied to the transport and storage chain of CCS, but not automatically to CO_2 capture. For instance, a CO_2 capture unit, applied to an existing power plant, is not automatically part of the RCR. In case of the ROAD project, the CO_2 capture applied to the new coal-fired power plant of E.On at the Maasvlakte (a fraction of the flue gas stream) is not part of the RCR procedure. The Province of Zuid Holland is the competent authority for the permitting procedure of this (demonstration) CO_2 capture plant. However, parties involved may choose to apply for the RCR in such a case. New power plants with CO_2 capture are automatically covered by the RCR, when the capacity is 500 MW or more.

The inpassingsplan, normally a part of the Wro, is also subject to the RCR. The inpassingsplan is usually required for pipeline construction, both onshore as well as offshore.

4.6 The Crisis and Recovery Act

The Crisis and Recovery Act, in Dutch referred to as the Crisis- en herstelwet, has become active at the end of March 2010. It is intended to speed up legal procedures of construction projects in order to improve the ailing Dutch economy. Among others, it affects the RCR and the EIA as well as the Act on Spatial Planning and as such the inpassingsplan (Kenniscentrum InfoMil). For more information reference is made in paragraph 6.10.

5 International developments on permitting procedure

IEA GHG (2006) is the first report of the IEA that outlines a range of permitting considerations for CCS activities across the full geographical chain of operations and the temporal dimension of the CCS operational life cycle. The research highlights the key environmental and health and safety regulatory and permitting considerations associated with each element of the chain across the whole temporal cycle. Some of the findings may have been superseded by (EU) legislation.

IEA (2010) is another publication of the IEA on this subject, with contributions from various governments and other organizations. In the EU, both the European Commission and member states are involved in regulating CCS. Member states that want to engage in CCS should put in place measures reflecting the EU CCS directive. With regard to the Netherlands the study presents a list of activities anticipated.

Zakkour and Haines (2007) analyze permitting issues of the CCS chain in a number of regions over the world. Their analysis suggests that the installation of a CO_2 capture plant at a power plant could trigger additional permitting considerations through several new characteristics of the plant, including, *inter alia*:

- Changes in the overall thermal efficiency of the plant triggered by the energy penalty imposed by the CO_2 capture plant;
- Changes in the exhaust parameters of the plant, which can change the nature of the flue gas plume;
- Changes in the concentration of various compounds in the flue gases due to the absence of the dilution effect of CO_2, etc.

For CO_2 transport, fewer additional permitting considerations were found to be critical[4]. Principally, considerations relate to:

- Higher pressures of CO_2 in dense phase in CO_2 pipelines relative to water or natural gas pipelines;
- Potential additional routing considerations to minimize any asphyxiation risks in the possible event of pipeline leakage.

For CO_2 storage sites, few comparable permitting regimes exist, and consequently a broad range of additional permitting considerations were identified. These include, *inter alia*:

- Permits for undertaking surveying activities for site selection and characterisation, such as well drilling and seismic surveying;
- Responsibility and liability issues associated with managing any leakage of CO_2 from storage reservoirs;
- Concerns over ecological and human health risks posed by any leakage of CO_2, both to the air directly above the storage reservoir and into adjacent soil and groundwater;

[4] There are a few important issues with respect to modeling of CO_2 leakage from pipelines. Within the CATO2 Program (WP4.4) models are being developed to quantify accidental release of CO_2 from high-pressure pipelines.

- Issues about liability and responsibility for undertaking long-term stewardship of storage sites to ensure that the CO_2 remains safely sequestered;
- There are also issues associated with licensing multiple users of underground resources at the same or overlapping sites and trans-boundary sub-surface migration of stored CO_2;
- How CO_2 storage sites can be monitored, how (quantified) data on any leakage can be determined and reported, and how this can be incorporated into the permitting process, etc.
- Additionally, the handling of large quantities of CO_2 at very high pressure on offshore platforms is expected to raise new safety issues, which will have to be addressed during the permitting process.

An overview of the extent of gaps in permitting regulations and legislation is shown in Table 5.1. Darker shaded areas have fewer issues than those which are lighter. The general conclusion of Zakkour and Haines is that permitting systems for CO_2 capture and transport require little modification, but major developments are needed for the subsurface element. Furthermore, there are significant issues, which already have to be addressed at the planning stage.

Table 5.1 ***Global overview of gaps in permitting regimes***

Element	Phase		
	Planning & construction	Operation	Closure and decommissioning
Capture	Minor issues to be resolved	No significant issues	No significant issues
Transport	Minor issues to be resolved	No significant issues	No significant issues
Injection and storage	Significant issues and gaps. Long term stewardship may have to be addressed.	Ongoing issues, mainly addressed in planning phase.	Mainly addressed in planning phase and by long term stewardship permitting
Long term stewardship	Significant issues and gaps. General requirements may have to be addressed early.	Significant issues. Requirements may have to be refined.	Significant issues and gaps which have to be resolved by this phase.

According to Hill *et al*. (2009), an EIA for a hypothetic 400 MW_e IGCC (Integrated Gasification Combined Cycle) plant with offshore CO_2 storage (UK) would have the following characteristics:

- Power plant: no significant differences in requirements for EIA between a power plant without or with CCS;
- Transport: same methodology as ‘gas pipeline’, but safety classification high pressure CO_2 needed;
- Storage:
  - Injection of CO_2 – similar to gas/oil industry at sea;
  - Storage of CO_2 – balance between assuming no impact of CO_2 and large number of highly improbable events which could harm the environment.

Anderson *et al*. (2007) contend that finding solutions to societal problems that do not cause other new problems requires a strong methodology that enables us to avoid, predict and deal with the challenges. They present SEA as one potential methodology to analyze and evaluate the idea of CCS as one of the solutions to the problem with global climate change.

CSLF (2010) gives the following recommendations with regard to CO_2 storage in the timeframe 2009-2013[5]:

- Develop national and global atlases of CO_2 storage site and capacity;
- Determine allowable impurities in the CO_2 injected for storage;
- Establish standardized methodologies for estimating site-specific and worldwide storage capacity;
- Successfully complete pilot field tests for validation of injection and Measurement, Monitoring and Verification (MMV);
- Establish methodologies and models for predicting the fate and effects of injected CO_2 and for risk, including wellbore integrity assessment;
- Initiate large-scale field tests for injection and MMV;
- Establish industry best practices guidelines for reservoir selection, CO_2 injection, storage, and MMV;
- Develop remediation measures, including remediation techniques (foam/ gel etc.) to maintain and/or restore sealing efficiency.

Another important aspect in international developments on permitting procedures of CCS is the issues related to cross border permitting processes. It is expected that in the future, the development of large-scale CCS network will require cooperation between different countries. This could lead to complicated international permitting procedures, for instance when one country stores the CO_2 of another country. Due to a lack of experience with this topic, however, very little is known on this subject. A possible analogy would be gas transport, which is in many ways quite similar to CO_2 transport, albeit in a much more mature stage. Research into this topic is still ongoing.

[5] Many are studied at the moment this report is issued.

6 Common practice in permitting CCS projects

This chapter describes the results of the interviews with the stakeholders (see paragraph 3.3 and 3.4). It gives an overview of the permits involved in Dutch CCS projects. Also attention has been given to specific stages of the permitting process.

An overview of the required permits and the related planning for large-scale CCS demonstration projects is presented in Appendix D.

6.1 Procedure from CCS initiative to irrevocable permits

The required permits for CO_2 capture, transport and storage installations are subject to the EIA procedure. Figure 6.1 shows the different steps from initiative for a CCS project up to the final point where irrevocable permits are obtained.

A final investment decision (FID) is followed by a detailed design. The first step in an EIA procedure is the publication of a Start note (or plan EIA report). Before an application for a permit can be filed, in most cases (if not all) an Environmental Impact Assessment (EIA) for a whole CCS chain is needed (Project EIA report). Such an EIA differs in scope and geographical area from common practice as the CCS chain encompasses very different stages, i.e. CO_2 capture, CO_2 transport, and CO_2 storage, which also differ in geographical respect. Therefore, in the case of CCS there are comparable procedures for these three stages. When the EIA is completed the initiator can apply for the necessary permits, coordinated by the Ministry of EL&I. When the final permits are available there is only one objection and appeal possibility at the Council of State (in Dutch RvS, Raad van State). When the RvS upholds the permits, these become irrevocable.

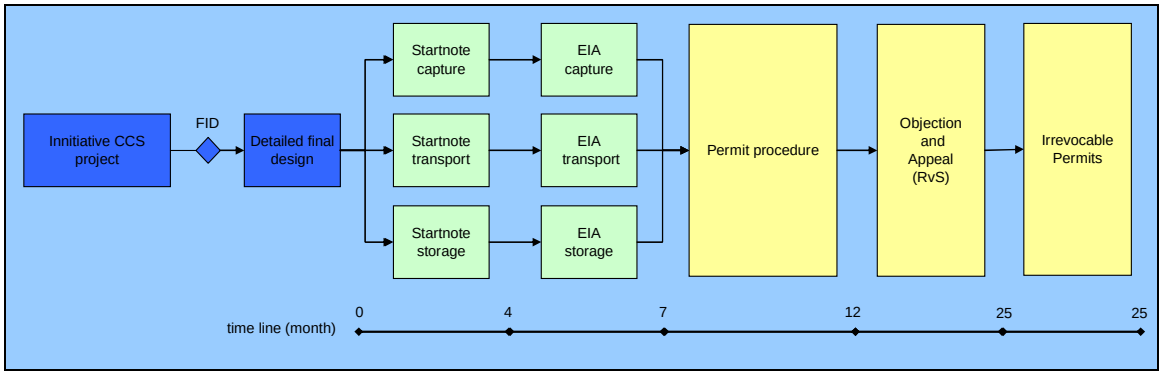

Figure 6.1 ***Different steps from initiative for a CCS project up to irrevocable permits***

Until this date the Rijkscoördinatieregeling (RCR) has only been applied to CO_2 transport and CO_2 storage, at least in case of retrofitting of a coal-fired power plant with CCS. A CO_2 capture unit, applied to an existing power plant, is not automatically part of the RCR, but it can be incorporated. Newly built power plants with CO_2 capture are automatically covered by the RCR.

With regard to the application of the RCR to a CCS project, it is noteworthy that the competent authorities (CAs) remain responsible for their own permit decisions. The Ministry of EL&I may

overrule a Province or municipality ('doorzettingsmacht'), but it is regarded undesirable that the Ministry will proactively push or overrule CAs, mainly to prevent loss of support for the project.

The applicant is responsible for the permit application. The competent authority describes which information is required, for instance for CO_2 storage information on the subsurface, characteristics of the reservoir considered, risks of CO_2 breakout accidents. When the information has been received and analyzed, the authority decides on the permit application. The procedure is: draft permit, public consultation, final permit, possibility of appeal, decision by RvS.

The timeframe depends *inter alia* on the complexity of the process of providing and analyzing information, public consultation, appeals, etc. The time line in figure 6.1 is derived from the planning for large-scale CCS demonstration projects made by Stichting Borg and the Ministry of EL&I (Appendix D).

For a new-built coal-fired power plant the Nature Protection Act (Natuurbeschermingswet) and the Act on Environmental Protection (Wm) are the most important regulations in the permit procedure.

6.2 Retrofitting existing installations

For an existing installation that is to be equipped with CO_2 capture, the applicant needs a 'Veranderingsvergunning' in the framework of the Act on Environmental Protection (Wm), since the permit for the existing power plant is no longer valid. This is mainly caused by changes in emissions and energy use which impair the prevalent permit. For these cases the Province is the relevant authority.

For all the different combinations of power production (gas, coal, biomass) and CO_2 capture, the main framework for permitting is the Act on Environmental Protection (Wm).

6.3 Difference between onshore and offshore CO_2 storage

In the case of offshore CO_2 storage the number of permits needed for the whole CCS chain will be smaller than for onshore CO_2 storage. For offshore storage (outside the 12 miles zone), the Wabo doesn't apply. There is also no need to amend the Zoning plan (in Dutch: Bestemmingsplan). What is more, there is only one Competent Authority, i.e. the national government (municipalities and provinces do not have any mandate on the Dutch continental shelf). During the permitting procedure for offshore CO_2 storage, it is likely that fewer appeals will be made, because there are fewer stakeholders. Fewer appeals, however, do not imply that permits will be granted within a shorter timeframe.

Outside the 12 miles zone, the Mining Act applies, next to regulation with regard to shipping (Scheepvaartverkeerswet), the Water Act and international acts or regulations (e.g., the OSPAR convention). When CO_2 is stored within the 12 miles zone, several permits or exemptions from acts relevant for onshore CO_2 storage may apply. Examples are exemptions needed from the Flora and Fauna Act, the Act on Nature Conservation, etc. (in case of the Flora and Fauna Act, the operator of a CCS or CO_2 storage project does not need a permit, but an exemption).

Some interviewees noted that it is generally assumed that operators of CO_2 storage facilities will apply for permits or exemptions for CO_2 storage in a depleted gas reservoir. The reason is that it is much more cost-effective and easier to demonstrate that the CO_2 is stored safely and permanently in a depleted gas reservoir than in a saline aquifer. Current articles in the Mining Act related to the EU CCS Directive do not distinguish between CO_2 storage in a depleted gas field and storage in a saline aquifer. However, the nature of a gas field makes it inherently likely to be able to contain CO_2, because it has contained gas for an extended period, while this is not the case for a saline aquifer. In addition, there is in general a lot more information available on depleted gas fields than on aquifers, since gas fields have been produced for several years. Another important difference is that injecting in a depleted gas field requires lower pressures than injecting in an aquifer and in the case of aquifers, CO_2 can dissolve in water. These different circumstances require a different legislation and hence the need for a clear distinction in the Mining Act.

For an offshore CO_2 pipeline (for example the ROAD project), most of these permits or exemptions do not apply as spatial planning and environmental protection (in the framework of the Act on Spatial Planning, referred to in Dutch as the Wet ruimtelijke ordening, or Wro, and the Act on Environmental Protection, referred to as the Wet milieubeheer, or Wm, respectively) are not applicable outside the 12 miles zone. Therefore, an offshore CO_2 pipeline stretching beyond this range does not need a permit in the framework of the Wro or Wm for the trajectory beyond 12 miles. In case of offshore CO_2 transport and storage, permits for crossing of dunes or waterways (Rijkswaterstaat) may apply.

6.4 Permits that are more difficult to obtain and reasons why

Nature Conservation Act (Natuurbeschermingswet)
It needs to be proven that there are no significant effects on nature (Natura 2000 areas) for the total CO_2 chain from capture to storage. The quantification of a significant effect has been discussed by the Ministry of Agriculture, Nature protection and Food safety (currently partly incorporated in the Ministry of EL&I). The Nature Conservation Act appears to have (had) a relatively large impact on permits for coal-fired power plants bordering the Waddenzee, but also for new power plants located at the Maasvlakte. The Nature Conservation Act could also cause difficulties for CCS projects, as there is still limited experience with this act.

Storage License (Opslagvergunning)
One of the steps in the procedure for a CO_2 storage license is the assessment of the storage operator by EL&I, SodM and TNO (time required: a few months). The main criteria are effectiveness and efficiency. However, there is still hardly any experience with the storage license.

Some interviewees contended that in case of CO_2 storage a company has to demonstrate in advance how, in case of CO_2 leakage, it will quantify the CO_2 escaping from the subsurface. In the case of malfunctioning of the storage container it will be difficult to show that CO_2 has escaped from the structural trap. Quantification of how much CO_2 is still underground and how much has escaped to the atmosphere will be even more difficult. It is expected that in case of good monitoring practice this stage will never occur. Possible leakage must be discovered in an early stage and actions must be taken long before the CO_2 escapes from the surface. To a lesser

extent, this also applies to CO_2 transport by pipeline (in particular for pipelines in tunnels). Also, a municipality may not be cooperative to provide an exemption for explorative seismic investigation. Normally, such an exemption is a simple administrative procedure.

EL&I and the other parties can start an inquiry to find a more eligible candidate to operate the CO_2 storage. If indeed they find another operator this could cause new problems because another operator might require different standards for the delivery of CO_2. This in turn may (theoretically) impact on the stages of CO_2 capture and CO_2 transport. The assessment criteria are not well defined. Therefore, 'vague' criteria pose a risk to a CCS project.

Wabo

The permit in the framework of the Wabo is relatively time consuming because it is a central permit, involving advice from a number of experts. Whether the Wabo will actually reduce the time needed for permits in case of a CCS project will have to be demonstrated.

6.5 Parties involved in the permitting procedure

For CO_2 transport and storage, the Ministry of Economic Affairs, Agriculture and Innovation (EL&I) is the coordinating authority. The Ministry also takes care of the 'Rijkscoördinatieregeling'.

Generally the Provinces are responsible for the Act of Environmental Protection and as such involved in several of the permits for CO_2 capture. Municipalities are involved in the permitting process on a more local scale, such as those for felling trees, construction activities and noise disturbance.

In the case of CO_2-storage in an empty gas field the Minister of EL&I is the competent authority (because of Wabo) for the "omgevingsvergunnig" related to mining activities at the storage location.

The Netherlands Commission for Environmental Assessment advises on the contents of the required EIAs, and on the quality of the EIA when it has been published.

The TNO Advisory group of Economic Affairs advises the Ministry of EL&I on the geotechnical aspects of the CCS project. Subsequently, the Mining Council (Mijnraad in Dutch), taking this advice into account, provides advice to the Minister of EL&I on whether or not to grant the permit.

The State Supervision of Mines supervises the correct implementation of relevant legislation regarding CO_2 storage. It is also involved in supervising legislation regarding the safety of gas transport networks and it makes sure that these laws are followed correctly. In addition, it advices the ministry of EL&I on technical issues in permitting procedures for CCS.

Finally, the European Commission is entitled to overview the implementation of the CCS Directive with respect to the initial stage of CO_2 storage. According to Article 25 of the CCS Directive:
'In the early phase of the implementation of this Directive, to ensure consistency in implementation of the requirements of this Directive across the Community, all storage permit applications should be made available to the Commission after receipt. The draft storage permits should be transmitted to the Commission to enable it to issue an opinion on the draft permits

within four months of their receipt. The national authorities should take this opinion into consideration when taking a decision on the permit and should justify any departure from the Commission's opinion. The review at Community level should also help to enhance public confidence in CCS'.

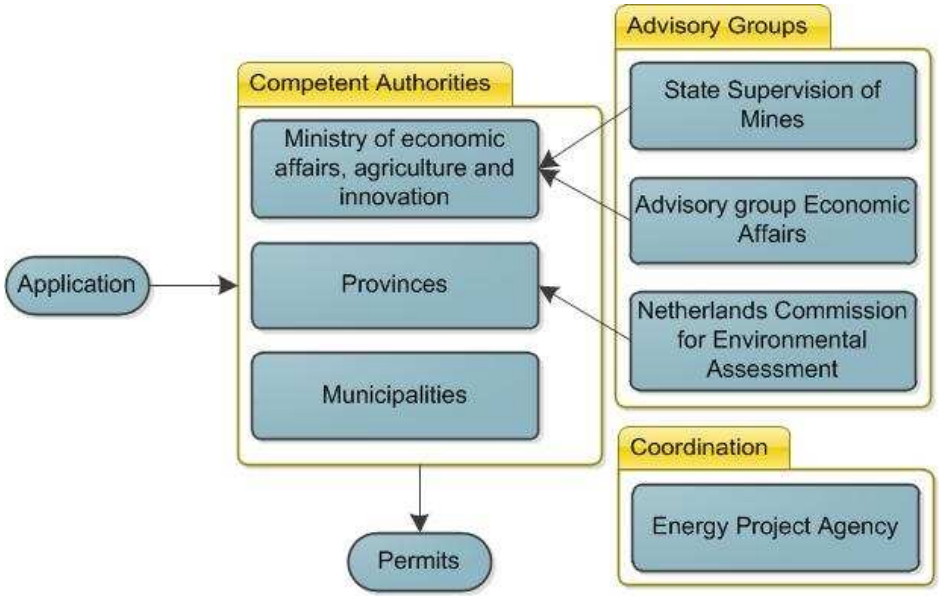

Figure 6.2 ***Dutch parties involved in the permitting procedure***

6.6 Potential problems (to be) encountered in the permitting process

The following list shows some problems which can affect, among other things, the permitting procedure:

- Change of political direction (Government, Province, Municipality);
- Loss of public support for CCS and in particular for CO_2 storage;
- Loss of support from competent authority (terms are tight, a lot of information is needed that is 'Raad van State proof', harmonization of permit applications);
- Lack of coordination between the initiators of the CCS project and the RCR coordinator.

For the application of a permit for CO_2 capture, no specific problems have been reported by the relevant respondents. Some interviewees put forward a number of issues, i.e. emission of nitrosamines (carcinogenic in small amounts) from post-combustion CO_2 capture, waste from CO_2 capture in quantity and quality, and energy use related to CO_2 capture. However, the issues did not appear to cause insurmountable difficulties for the interviewee engaged in applying for a permit for CO_2 capture.

For CO_2 storage, some interviewees contended that it may be rather complicated to provide evidence that the storage of CO_2 is safe and permanent, which is required by the Mining Act (implementation of the EU CCS Directive). Also, CO_2 emission permits for CO_2 transport and CO_2 storage (ETS) may incur difficulties. A company interested in CO_2 storage will generally apply for a permit to store CO_2 in a depleted gas reservoir. However, if it would apply for CO_2 storage in a saline aquifer the burden to prove that the CO_2 is stored safely and permanently will probably be much larger than in case of a depleted gas field. Also, it may be really difficult to quantify how much CO_2 is still underground and how much has escaped to the atmosphere in case of CO_2 leakage. It is, however, expected that many of these problems would probably disappear by frequent contact with the competent authorities, as here the element of interpretation of the law would play an important role.

The monitoring of the total CCS chain for ETS will be a challenge. For an emission license emitters have to hand in a monitoring plan and are obliged to make a yearly emission report. When somewhere in the chain the CO_2 is handed over to another operator (for instance from the operator of the capture plant to the operator for transport and storage), all operators involved in the chain have to monitor and report their emissions for ETS.

6.7 Transposition of the EU CCS Directive into the Mining Act

There is room for interpretation of the EU CCS Directive by the member states. With respect to the Mining Act (Mijnbouwwet) the following aspects are not totally clear yet:

- Liability (not regulated by the CCS Directive);
- Financial security[6];
- Cost of storage transfer to the authorities[6].

Some interviewees have noted, that the Mining Act does not require an operator of a gas field to make provisions to mothball specific facilities for future CO_2 storage. This is not feasible as the national government as a matter of principle does not introduce additional national rules when implementing EU Directives.

6.8 Additional requirements expected for the future permitting process

Legislation must always be in accordance with EU regulations. But governments can impose additional regulations on top of EU guidelines. According to several interviewees this is however, unlikely.

6.9 Time required for the permitting process for a CCS chain and other comparable processes

The time required to get the permits for a CCS project is comparable with a normal scheme for a large power plant. Formal procedures are rather straightforward within the RCR, but no absolute guarantee that timelines will be met. See also paragraph 6.1 and Appendix D: overview provided by Stichting Borg and the Ministry of EL&I on permitting process.

[6] The last two items are dealt with in the Guidance Document 4: Article 19 Financial Security and Article 20 Financial Mechanism.

There is only limited experience with permits for CCS projects. In general, the Rijkscoördinatie-regeling may serve as an umbrella for the permits and exemptions from acts or regulations that are needed. However, it is not evident whether this directive will significantly reduce the period of time needed to obtain the permits of interest. Some interviewees suggested that the Rijkscoördinatieregeling may be beneficial in general for the permitting procedure. As a matter of fact, there is already some experience with the reduction of the time needed for permitting of wind farms that can apply for the Rijkscoördinatieregeling, but this experience may not be very relevant for CCS projects. That will be borne out in the future.

6.10 Suggestions for improvement in the permitting process

The following suggestion has been noted by the interviewees with respect to communication:

- Neutral information about CCS is of the utmost importance and should be widely available. The public support for CCS, as a new technology for mitigation of the climate issue, is rather poor. In comparison with other mitigation options, like renewables and energy conservation, people are less positive about CCS. One of the reasons for this is the lack of knowledge about the climate issue in general and about CCS in particular. Besides that, the opinion of the public is sometimes based on misunderstandings and false or 'coloured' information via the media. All this results in a reluctant attitude of the public. Opposition against CCS hinders the implementation of technology and risks long term climate targets becoming unattainable.

Some interviewees made mention of difficulties encountered in the Barendrecht CCS project because the municipality of Barendrecht was opposed to this project from the outset. Since the national government was assumed to coordinate the CCS project, this 'intergovernmental' conflict with the municipality turned out to be highly challenging. It is desirable that in the future better opportunities for cooperation will emerge.

As also mentioned in chapter 4, today the Minister of Economic Affairs, Agriculture, and Innovation (EL&I) is the coordinating Minister in case of CO_2 transport and storage projects. The Rijkscoördinatieregeling (RCR), requires *inter alia* a so-called Rijksinpassingsplan (a governmental plan to fit the project in the environmental regulation). Also, the 'Crisis- en herstelwet' (Crisis and Recovery Act) may be applied to a CCS project. This Act, which came into force on March 18th, 2010, aims to accelerate the permitting procedure for specific projects:

- Renewable energy projects, *inter alia* with respect to onshore wind projects (radar zones);
- Infrastructure projects to improve accessibility of economic centers and cities;
- Projects aimed at climate neutrality and projects of superregional importance such as CO_2 capture and storage, activities which are governed by the Mining Act;
- Accelerated development of housing projects and business sites[7].

Other interviewees made mention of difficulties with regard to the timeframe of monitoring CO_2 storage by the operator of the CO_2 storage facility. It may be helpful to reduce the period of time

[7] The Crisis and Recovery Act also contains amendments to ascertain that (chemical) industries involved in CO_2 capture and storage (CCS) activities, governed by the Mining Act, remain in general under the auspices of the province with respect to their environmental regulation.

for monitoring by the operator of the facility and enable the transfer of the CO_2 storage facility to the government in a reasonably short period.

6.11 Possible contribution of the CATO-2 parties to the improvement of the permitting process

It would be very helpful for the permitting process when CATO would further contribute to making neutral information available to CCS stakeholders on all aspects of carbon capture and storage. Also a Best Practice document on permitting can be helpful for new initiatives for CCS projects.

One of the questions refers to the interaction on permits or licenses between oil or gas companies with licenses for gas production on the one hand and operators of a (future) CO_2 storage facility on the other hand. The reason for this question is that a proactive attitude of the current operator of a gas field may reduce the level of future investment, as the current operator may make provisions to mothball specific facilities. However, according to some interviewees, the production license of an operator of a gas field does not require such provisions. The trade-off between the interests of the current production operator and the future storage operator are an important consideration that can have a profound effect on the attractiveness of CCS in the future.

Due to the shift in focus in the Netherlands to offshore CO_2 storage, ship transport has to get more attention. Ship transport may offer a cost-effective alternative to CO_2 transport by pipelines. Especially for smaller offshore fields, where no pipeline infrastructure is available yet, ship transport could be an interesting option (EBN and Gasunie, 2010).

7 Follow-up activities

The results achieved within this study will be communicated and discussed with the CCS stakeholders in the Netherlands during a workshop to be held in December 2011. Also input from other CATO-2 work packages will be gathered. Moreover, participating in the relevant CCS networks would hopefully provide additional insights in the CCS permitting issues.

The feedback from the stakeholder workshop and CATO-2 work packages, and the additional insights from the CCS networks will be used to define the research issues within this work package for 2012-2013. The feedback will be worked out in the next deliverables of WP4.2, namely D05, and D06, to be provided at the end of 2011.

8 Conclusions and recommendations

An overview of the required permits and the related planning for large-scale CCS demonstration projects has been provided. This overview has been made by Stichting Borg and the Ministry of EL&I, and is based on the required permits for the onshore CCS project in Barendrecht and the ROAD project with offshore CO_2 storage.

Based on the results achieved in this study, the following conclusions and recommendations can be made:

- A Best Practice document on permitting can be helpful for new initiatives for CCS projects.
- It would be very helpful for the permitting process when CATO would make neutral information available to CCS stakeholders on all aspects of carbon capture and storage.
- The time required to get the permits for a CCS project is comparable with a normal scheme for a large power plant. Formal procedures are rather straightforward within the RCR, but no absolute guarantee that timelines will be met. This will only become apparent in the future.
- The permit in the framework of the Wabo is relatively time consuming because it is a central permit, involving advice from a number of experts. Whether the Wabo will actually reduce the time needed for permits in case of a CCS project will have to be demonstrated.
- An important potential problem in the permitting process is the lack of coordination between the initiators of the CCS project and the RCR coordinator. From the onset of the project, during the preparation phase, cooperation between the two parties should be close, in order to streamline the permitting process and prevent misunderstandings along the way.
- Some interviewees made mention of difficulties encountered in the Barendrecht CCS project because the municipality of Barendrecht was opposed to this project from the outset. Since the national government was assumed to coordinate the CCS project, this ‘intergovernmental’ conflict with the municipality turned out to be highly challenging. It is desirable that in the future better opportunities for cooperation will emerge. The Rijkscoördinatieregeling and Crisis and Recovery Act are expected to provide improvements in this respect.
- Current articles in the Mining Act related to the EU CCS Directive do not distinguish between CO_2 storage in a depleted gas field and storage in a saline aquifer. However, the different circumstances of CO_2 storage for these two options require a different legislation and hence the need for a clear distinction in the Mining Act.
- Due to the shift in focus in the Netherlands to offshore CO_2 storage, ship transport has to get more attention. Ship transport may offer a cost-effective alternative to CO_2 transport by pipelines. Especially for smaller offshore fields, where no pipeline infrastructure is available yet, ship transport could be an interesting option.

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Appendix A Overview of the permits in the Wabo[8]

Wet/verordening	Artikel	Toestemming	Huidig bevoegd gezag
Wet ruimtelijke ordening	3.3	Aanlegvergunning en sloopvergunning o.g.v. het bestemmingsplan	B&W
	3.6, lid 1, c	ontheffing van het bestemmings-plan in bij het plan aangewezen gevallen	B&W
	3.7, lid 3	aanlegvergunning en sloopvergunning op grond van een voorbereidingsbesluit	B&W
	3.7, lid 4	in het voorbereidingsbesluit opgenomen ontheffing van het in het voorbereidingsbesluit opgenomen verbod om het bestaande gebruik te wijzigen	B&W
	3.10	***Projectbesluit***	Gemeenteraad (delegatie aan B&W mogelijk)
	3.22, lid 1	***Tijdelijke ontheffing van het bestemmingsplan***	B&W
	3.23, lid 1	Ontheffing van het bestemmingsplan in bij amvb aangegeven gevallen van beperkte planologische betekenis	B&W
	3.26, lid 2	***Vergunningen en ontheffingen op basis provinciaal inpassingsplan en provinciaal voorbereidingsbesluit***	GS
	3.27, lid 1	***projectbesluit ten behoeve van project van provinciaal belang***	PS (delegatie aan GS mogelijk)
	3.28, lid 2	***Vergunningen en ontheffingen op basis rijksinpassingsplan en ministerieel voorbereidingsbesluit***	Min IenM
	3.29, lid 1	***projectbesluit ten behoeve van project van nationaal belang***	Min IenM
	3.38, lid 3	aanlegvergunning en sloopvergunning op grond van beheersverordening	B&W
	3.38, lid 4	ontheffing van de beheersverordening in bij de verordening aangewezen gevallen	B&W
	3.38, lid 6	***tijdelijke ontheffing van de beheersverordening***	B&W
	3.38, lid 6	Ontheffing van een beheersverordening in bij amvb aangewezen gevallen van beperkte planologische betekenis	B&W
	3.40, lid 1	***buiten toepassingverklaring van de beheersverordening ten behoeve van de realisering van een project***	Gemeenteraad (delegatie aan B&W mogelijk)
	3.41, lid 1	***buiten toepassingverklaring van de beheersverordening ten behoeve van de realisering van project van provinciaal belang***	PS (delegatie aan GS mogelijk)
	3.42, lid 1	***buiten toepassingverklaring van de beheersverordening ten behoeve van de realisering van een project van nationaal belang***	Min IenM
	4.1, lid 3	***mogelijkheid tot ontheffing van de bij provinciale verordening gestelde regels, voor zover deze rechtstreeks werken***	GS
	4.1, lid 5	aanlegvergunning, sloopvergunning of ontheffing van een verbod om het bestaande gebruik te wijzigen bij een verklaring dat een provinciale verordening als bedoeld in artikel 4.1 wordt voorbereid	GS
	4.2, lid 3	aanlegvergunning, sloopvergunning of ontheffing van een verbod om het bestaande gebruik te wijzigen op grond van een voorbereidingsbesluit bij een aanwijzing van de provincie	GS
	4.3, lid 3	***mogelijkheid tot ontheffing van de algemene regels van het Rijk, voor zover deze rechtstreeks werken***	Min IenM

[8] http://www.infomil.nl/onderwerpen/integrale/omgevingsvergunning/wetgeving

Wet/verordening	*Artikel*	*Toestemming*	*Huidig bevoegd gezag*
	4.3, lid 4	aanlegvergunning, sloopvergunning of ontheffing van een verbod om het bestaande gebruik te wijzigen bij een verklaring dat algemene regels als bedoeld in artikel 4.3 worden voorbereid	Min IenM
	4.4, lid 3	aanlegvergunning, sloopvergunning of ontheffing van een verbod om het bestaand gebruik te wijzigen op grond van een voorbereidingsbesluit bij een aanwijzing van het Rijk	Min IenM
	6.12, lid 6	Ontheffing van een verbod tot uitvoering van werken en werkzaamheden in gevallen waarin dat in een exploitatieplan is bepaald	B&W
	6.13, lid 2,e	In het exploitatieplan een ontheffingstelsel op te nemen van eisen en regels die in het explotatieplan gesteld worden	Gemeenteraad (delegatie aan B&W mogelijk)
Woningwet	40, lid 1	Bouwvergunning	B&W
	6	Ontheffing van het Bouwbesluit	B&W
Bouwverordening		Sloopvergunning	B&W
		Ontheffing van voorschrift Bouwverordening	B&W
Besluit brandveilig gebruik bouwwerken	2.11.1, lid 1	***Gebruiksvergunning***	B&W
Wet milieubeheer	8.1, lid 1	***Milieuvergunning***	B&W/GS/Min ELenI/ Min IenM
	8.19, lid 2	Meldingsplicht veranderingen van de inrichting of van de werking daarvan	B&W/GS/Min ELenI/ Min IenM
Mijnbouwwet	40	***Mijnbouwmilieuvergunning***	Min ELenI
Wet verontreiniging oppervlakte wateren/ Wet milieubeheer	1, lid 2 10.30, lid 3 10.63	Vergunning voor indirecte lozingen (in het huidige systeem zijn dit twee vergunningen, nl. Wvo en Wm)	Wvo: Waterschap Wm: lozingen buiten inrichtingen B&W. Lozingen binnen inrichtingen (Ivb): B&W/GS/Min IenM
Monumentenwet 1988	11, lid 2	***Monumentenvergunning***	B&W
	37, lid 1	Sloopvergunning in beschermde stad- of dorpsgezichten	B&W
Provinciale verordening		Monumentenvergunning	GS
Gemeentelijke verordening		Monumentenvergunning	B&W
Provinciale verordening		Opslagvergunning (roerende zaken)	GS
Provinciale verordening		Aanleggen en veranderen v.e. weg	GS
Gemeentelijke verordening		Aanleggen en veranderen v.e. weg	B&W
Gemeentelijke verordening		Opslagvergunning (roerende zaken)	B&W
Gemeentelijke Verordening		Uitwegvergunning	B&W
Provinciale Verordening		Uitwegvergunning	GS
Gemeentelijke Verordening		Vergunning voor het hebben van een alarminstallatie (geluid en licht) aan een onroerende zaak	B&W
Gemeentelijke Verordening		Kapvergunning	B&W
Gemeentelijke verordening		Reclamevergunning	B&W
Gemeente-, provincie-, waterschapsverordening		Toestemmingen uit gemeentelijke / provinciale / waterschapsverordingen die via 2.2, lid 2 Wabo in de verordeningen zijn aangewezen	B&W/GS/Waterschap

Wet/verordening	Artikel	Toestemming	Huidig bevoegd gezag
Wet milieubeheer	1.3, lid 1	Ontheffing van regels pmv voor zover ontheffingen voor gesloten stortplaatsen en grondwaterbeschermingsgebieden	GS
Natuurbeschermingswet 1998	16	Vergunning m.b.t. handelingen in een beschermd natuurgebied	GS/Min ELenI
	19d	Vergunning m.b.t. handelingen met gevolgen voor habitats en soorten	GS/Min ELenI
Flora- en faunawet	75, lid 3	Ontheffing div. verplichtingen	Min ELenI

aanhakers, die alleen bij samenloop integreren (deze toestemmingen vervallen niet)
Voor de duidelijkheid: de toestemmingen in bovenstaand blok zijn vet en cursief afgedrukt.

Besluit brandveilig gebruik bouwwerken	2.12.1	Gebruiksmelding (gelijktijdige melding niet verplicht)	B&W
Wet milieubeheer	8.41, lid 1	Meldingactiviteit m.b.t. niet-vergunningplichtige inrichtingen. (zgn. 8.40 - inrichtingen)	B&W/GS/ELenI/ Min IenM

meldingen tegelijk met een omgevingsvergunning (afzonderlijke procedure)

"Vette cursieve letters": De toestemmingen in ***vette cursieve*** letters, vallen onder de uitgebreide procedure van de Wabo.

N.B.: Ook in de gevallen waarin de aanvraag voor een project zowel een activiteit betreft waarvoor de uitgebreide voorbereidingsprocedure dient te worden gevolgd als een of meer activiteiten waarvoor kan worden volstaan met de reguliere voorbereidingsprocedure, wordt voor de gehele aanvraag de uitgebreide procedure gevolgd.

Appendix B Transposition of the EU CCS Directive in the Netherlands

In March 2010, the EU CCS Directive has been transposed in a straightforward way in a draft document for modification of the Dutch Mining Law (Mijnbouwwet). The legal proposal was approved by the Dutch Senate late May 2011 and officially published June 6, 2011. It entered into force on September 10th 2011. According to Article 31d of the Mining Act, the applicant has to fulfil the following obligations:

1. A permit for permanent storage of CO_2 including at least:
   a. The timeframe of injection of CO_2 and the geographical area of interest;
   b. The location and boundaries of the storage site and the area of the storage complex;
   c. Data with regard to the hydraulic entity;
   d. Regulations with regard to the process of CO_2 storage;
   e. The maximum amount of CO_2 that according to the permit may be stored;
   f. The boundary values of the pressure of the stored CO_2;
   g. The maximum permissible velocity and pressure of injection of CO_2 and the maximum permissible pressure of the stored CO_2;
   h. Risk management;
   i. Monitoring;
   j. Abandonment;
   k. Corrective measures;
   l. Ground movement;
   m. The composition of the CO_2 stream to be stored including the components that are added to enable monitoring and verification of CO_2 migration;
   n. The level of financial security or equivalent provision.
2. Department 3.4 of the General Act of Administrative Law (Algemene wet bestuursrecht) with the exception of article 3:18 is applicable to the preparation of the decision on permitting permanent storage of CO_2, as far as storage is not effected on the Continental Shelf or below the territorial sea in a storage reservoir at the seaside of the in the appendix of this Act determined line. Points of view may be brought forward by each and every person.
3. According to a generic administrative measure (AmvB, algemene maatregel van bestuur), regulations may be enacted pertaining to the first paragraph.

This is an example of the way in which the EU CCS Directive has been transposed in the Netherlands.

Appendix C Synopsis of guidance documents of EU CCS Directive

In 2011, four so-called guidance documents for Directive 2009/31/EC (the EU CCS Directive) were published (denoted in the Chapter 'References' as 'EC, 2011a, b, c, and d'). In the following, a synopsis is presented of these four guidance documents.

Guidance Document 1: CO_2 Storage Life Cycle Risk Management Framework

Guidance Document 1 addresses the overall framework for geological storage in the Directive 2009/31/EC on the geological storage of CO_2 (the so-called CCS Directive) for the entire life cycle of geological CO_2 storage activities including its phases, main activities and major regulatory milestones. Other issues addressed in the document include the high-level approach to risk assessment and management which is intended to ensure the safety and effectiveness of geological storage, and the processes by which the Competent Authority or Authorities (CA or CAs) in each Member State can interact with the operators at key project stages, particularly with regard to risk management.

Guidance Document 2: Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures

Guidance Document 2 builds on Guidance Document 1 and is (just like Guidance Document 1) a non-legally binding document, providing guidance on:

- Site selection;
- Composition of the CO_2 stream;
- Monitoring;
- Corrective measures.

With regard to site selection, the guidance document covers *inter alia* the subjects 'pre-existing knowledge and data', 'connectivity and pressure build-up', and 'storage-focused assessments'. With respect to composition of the CO_2 stream, the document covers *inter alia* the differences stemming from various CO_2 capture technologies – Post-combustion and Pre-combustion CO_2 capture, Oxy-fuel combustion, and CO_2 from industrial processes. The focus in this guidance document is on how to ensure that incidental substances and trace substances in the CO_2 stream do not adversely affect the integrity of the storage site or the relevant transport infrastructure (corrosion and impact on fluid characteristics), do not pose a significant risk to the environment and human health, and do not breach applicable EU legislation.

With regard to monitoring, the document focuses *inter alia* on:

- integration with EU ETS Monitoring and Reporting Guidelines;
- the relationship to preventive and corrective measures;
- responsibilities during project phases;
- monitoring methods, monitoring technology and scientific status;
- overall monitoring limitations;
- monitoring methods for pipeline leakage;
- monitoring options during post-closure pre-transfer period;

- Performance Standards;
- Scope and format of monitoring pans.

With regard to corrective measures, the guidance document focuses *inter alia* on:

- Legislative context;
- Relationship to monitoring and monitoring plan updates;
- Responsibilities during project phases;
- Corrective measures methods;
- Scope and format of corrective measures plan;
- Plan implementation, reporting and performance management.

Guidance Document 3: Criteria for Transfer of Responsibility to the Competent Authority

Guidance Document 3 addresses the issue of transfer of responsibility for all legal obligations from a site operator to the Competent Authority or Authorities (CA or CAs). Article 18 of the CCS Directive specifies the conditions under which all legal obligations can be transferred to the CA of the Member State. It is important to recognize that the scientific basis for CCS is evolving, as more information is gained through the ongoing global research and development efforts. Thus, the scientific knowledge-base on issues associated with transfer of responsibility will improve over time.

Guidance Document 4: Article 19 Financial Security and Article 20 Financial Mechanism

Guidance Document 4 is to provide guidance on Article 19 financial security and Article 20 financial mechanism of Directive 2009/31/EC. With regard to the financial security itself, the guidance document covers *inter alia*:

- Legislative context;
- Definition of financial security;
- Obligations that financial security must cover;
- Amounts of financial security;
- Acceptable instruments for financial security;
- Eligibility criteria for issuers of acceptable financial security instruments;
- Establishing and maintaining financial security;
- State aid implications.

With regard to the financial mechanism, the document covers:

- Legislative context;
- Definitions of financial contribution;
- Post-transfer obligations that financial contribution may cover;
- Estimation of amounts of financial contribution;
- Availability of contribution to the competent authority;
- Use of contribution by the competent authority;
- State aid implications.

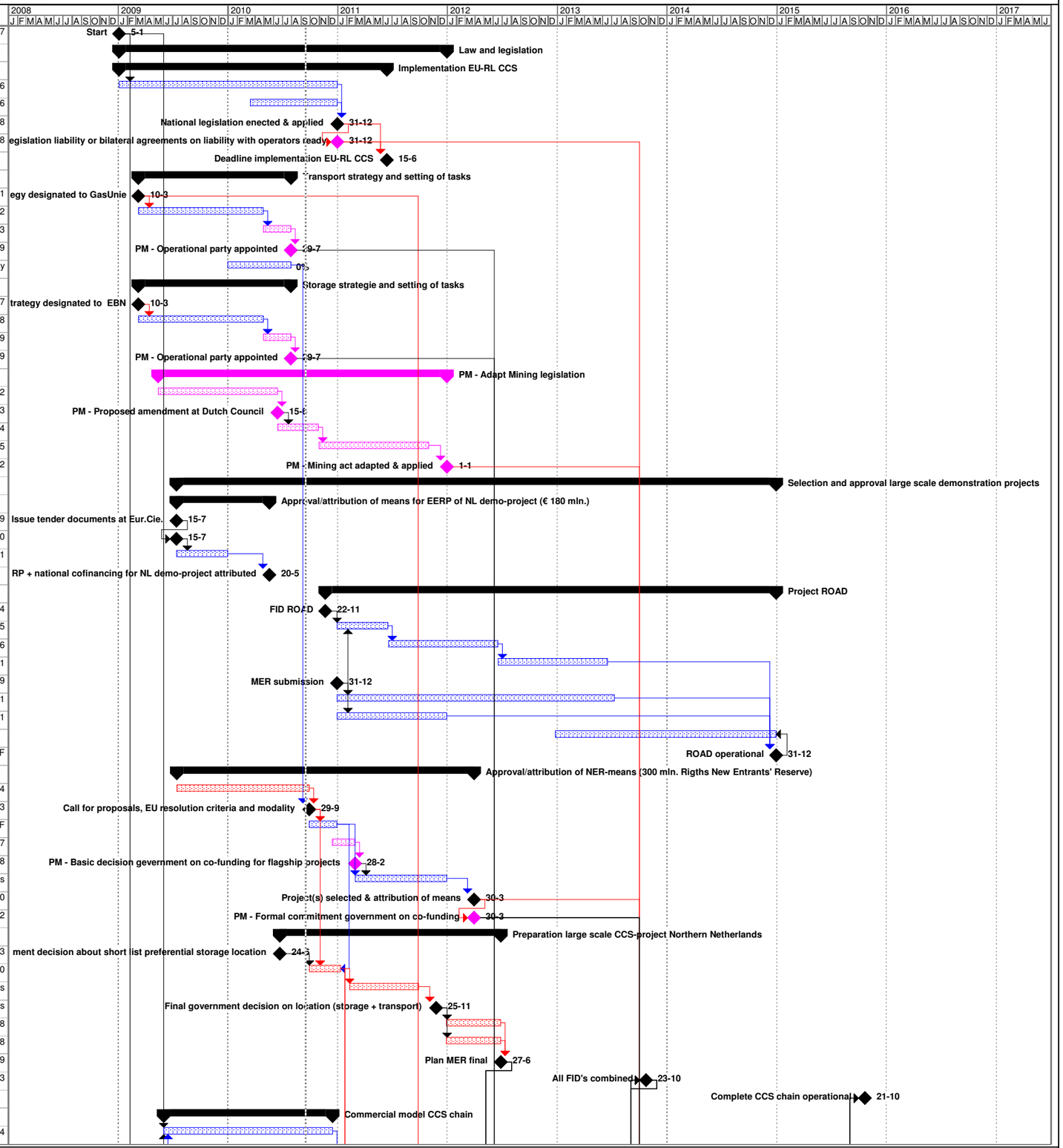
Appendix D Overview of the required permits and the related planning for large-scale CCS demonstration projects

Please click on the pdf file to open it.

Vergunningen planning Large scale (

Large Scale CCS Demonstration Projects

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
1	Start	0 days	Mon 5-1-09	Mon 5-1-09		4;87;62;107
2	**Law and legislation**	**780 days**	**Mon 5-1-09**	**Sun 1-1-12**		
3	**Implementation EU-RL CCS**	**637 days**	**Mon 5-1-09**	**Wed 15-6-11**		
4	Implementation EU-RL CCS	520 days	Mon 5-1-09	Fri 31-12-10	1	6
5	Parlementarial consideration national legislation	208 days	Wed 17-3-10	Fri 31-12-10		6
6	National legislation enected & applied	0 days	Fri 31-12-10	Fri 31-12-10	5;4	7;8
7	PM - Amendments national legislation liability or bilateral agr	0 days	Fri 31-12-10	Fri 31-12-10	6	112;8
8	Deadline implementation EU-RL CCS	0 days	Wed 15-6-11	Wed 15-6-11	6;7	
9	**Transport strategy and setting of tasks**	**364 days**	**Tue 10-3-09**	**Fri 30-7-10**		
10	Strategy designated to GasUnie	0 days	Tue 10-3-09	Tue 10-3-09		96;11
11	Formulate transport strategy (GasUnie)	298 days	Tue 10-3-09	Thu 29-4-10	10	12
12	PM - Decision-making government	65 days	Fri 30-4-10	Thu 29-7-10	11	13
13	PM - Operational party appointed	0 days	Thu 29-7-10	Thu 29-7-10	12	99
14	Resolution & application External Safety Pipelines (BEVB +	151 days	Fri 1-1-10	Fri 30-7-10		44FS+1 day
15	**Storage strategie and setting of tasks**	**363 days**	**Tue 10-3-09**	**Thu 29-7-10**		
16	Strategy designated to EBN	0 days	Tue 10-3-09	Tue 10-3-09		17
17	Formulate storage strategy (EBN)	298 days	Tue 10-3-09	Thu 29-4-10	16	18
18	PM - Decision-making government	65 days	Fri 30-4-10	Thu 29-7-10	17	19
19	PM - Operational party appointed	0 days	Thu 29-7-10	Thu 29-7-10	18	119
20	**PM - Adapt Mining legislation**	**686 days**	**Fri 15-5-09**	**Sun 1-1-12**		
21	PM - Adapt Mining legislation - proposal	283 days	Fri 15-5-09	Tue 15-6-10		22
22	PM - Proposed amendment at Dutch Council	0 days	Tue 15-6-10	Tue 15-6-10	21	23
23	PM - Dutch Council consideration	98 days	Wed 16-6-10	Fri 29-10-10	22	24
24	PM - Parliamental & governmental consideration	261 days	Mon 1-11-10	Mon 31-10-11	23	25
25	PM - Mining act adapted & applied	0 days	Sun 1-1-12	Sun 1-1-12	24	112
26	**Selection and approval large scale demonstration projects**	**1425 days**	**Wed 15-7-09**	**Wed 31-12-14**		
27	**Approval/attribution of means for EERP of NL demo-project**	**221 days**	**Wed 15-7-09**	**Thu 20-5-10**		
28	Issue tender documents at Eur.Cie.	0 days	Wed 15-7-09	Wed 15-7-09		29
29	Basic decision business & government financial contribution	0 days	Wed 15-7-09	Wed 15-7-09	28	30
30	Selection Eur.Cie. Demo-project & attribution of means	122 days	Wed 15-7-09	Thu 31-12-09	29	31
31	Means EERP + national cofinancing for NL demo-project att	0 days	Thu 20-5-10	Thu 20-5-10	30	
32	**Project ROAD**	**1072 days**	**Mon 22-11-10**	**Wed 31-12-14**		
33	FID ROAD	0 days	Mon 22-11-10	Mon 22-11-10		34
34	Design scope final	121 days	Fri 31-12-10	Fri 17-6-11	33;37	35
35	Detailed design	261 days	Mon 20-6-11	Mon 18-6-12	34	36
36	Materials, construction & commissioning	260 days	Tue 19-6-12	Mon 17-6-13	35	41
37	MER submission	0 days	Fri 31-12-10	Fri 31-12-10		34;38;39
38	Permits final and irrevocal	659 days	Fri 31-12-10	Wed 10-7-13	37	41
39	Transport materials, construction & commisioning	261 days	Fri 31-12-10	Fri 30-12-11	37	41
40	Storage materials, construction & commisioning	525 days	Wed 26-12-12	Wed 31-12-14	41FF	
41	ROAD operational	0 days	Wed 31-12-14	Wed 31-12-14	36;39;38	40FF
42	**Approval/attribution of NER-means (300 mln. Rigths New En**	**707 days**	**Thu 16-7-09**	**Fri 30-3-12**		
43	Definition / decision making allocation criteria	315 days	Thu 16-7-09	Wed 29-9-10		44
44	Call for proposals, EU resolution criteria and modality	0 days	Wed 29-9-10	Wed 29-9-10	14FS+1 day;43	45FS-1 day;53
45	Prepare proposals & check by member state (check data na	66 days	Wed 29-9-10	Wed 29-12-10	44FS-1 day	48;53FF
46	PM - Consultation government-business-districts on co-func	54 days	Wed 15-12-10	Mon 28-2-11		47
47	PM - Basic decision gevernment on co-funding for flagship p	0 days	Mon 28-2-11	Mon 28-2-11	46	48
48	Check of proposals by EIB en Eur. Commission	219 days	Tue 1-3-11	Fri 30-12-11	45;47	49FS+65 days
49	Project(s) selected & attribution of means	0 days	Fri 30-3-12	Fri 30-3-12	48FS+65 days	112;50
50	PM - Formal commitment government on co-funding	0 days	Fri 30-3-12	Fri 30-3-12	49	112;92;72
51	**Preparation large scale CCS-project Northern Netherlands**	**525 days**	**Thu 24-6-10**	**Wed 27-6-12**		
52	Government decision about short list preferential storage locatior	0 days	Thu 24-6-10	Thu 24-6-10		53
53	Preparation NER-proposal by companies	74 days	Thu 30-9-10	Tue 11-1-11	44;52;45FF	22 days;110;90;70
54	Preparation plan-MER results for final location decision by gover	164 days	Fri 11-2-11	Wed 28-9-11	53FS+22 days	55FS+42 days
55	Final government decision on location (storage + transport)	0 days	Fri 25-11-11	Fri 25-11-11	54FS+42 days	ays;56FS+23 days
56	Preparation plan-MER results for rijksinpassingsplan	130 days	Thu 29-12-11	Wed 27-6-12	55FS+23 days	58
57	Preparation rijksinpasssingsplan	130 days	Thu 29-12-11	Wed 27-6-12	55FS+23 days	58
58	Plan MER final	0 days	Wed 27-6-12	Wed 27-6-12	57;56	79;99;119
59	**All FID's combined**	**0 days**	**Wed 23-10-13**	**Wed 23-10-13**	**72;92;112**	73;93;113
60	**Complete CCS chain operational**	**0 days**	**Wed 21-10-15**	**Wed 21-10-15**	**67;85;105**	
61	**Commercial model CCS chain**	**402 days**	**Tue 2-6-09**	**Wed 15-12-10**		
62	Commercial model	402 days	Tue 2-6-09	Wed 15-12-10	107;1;87;66	64



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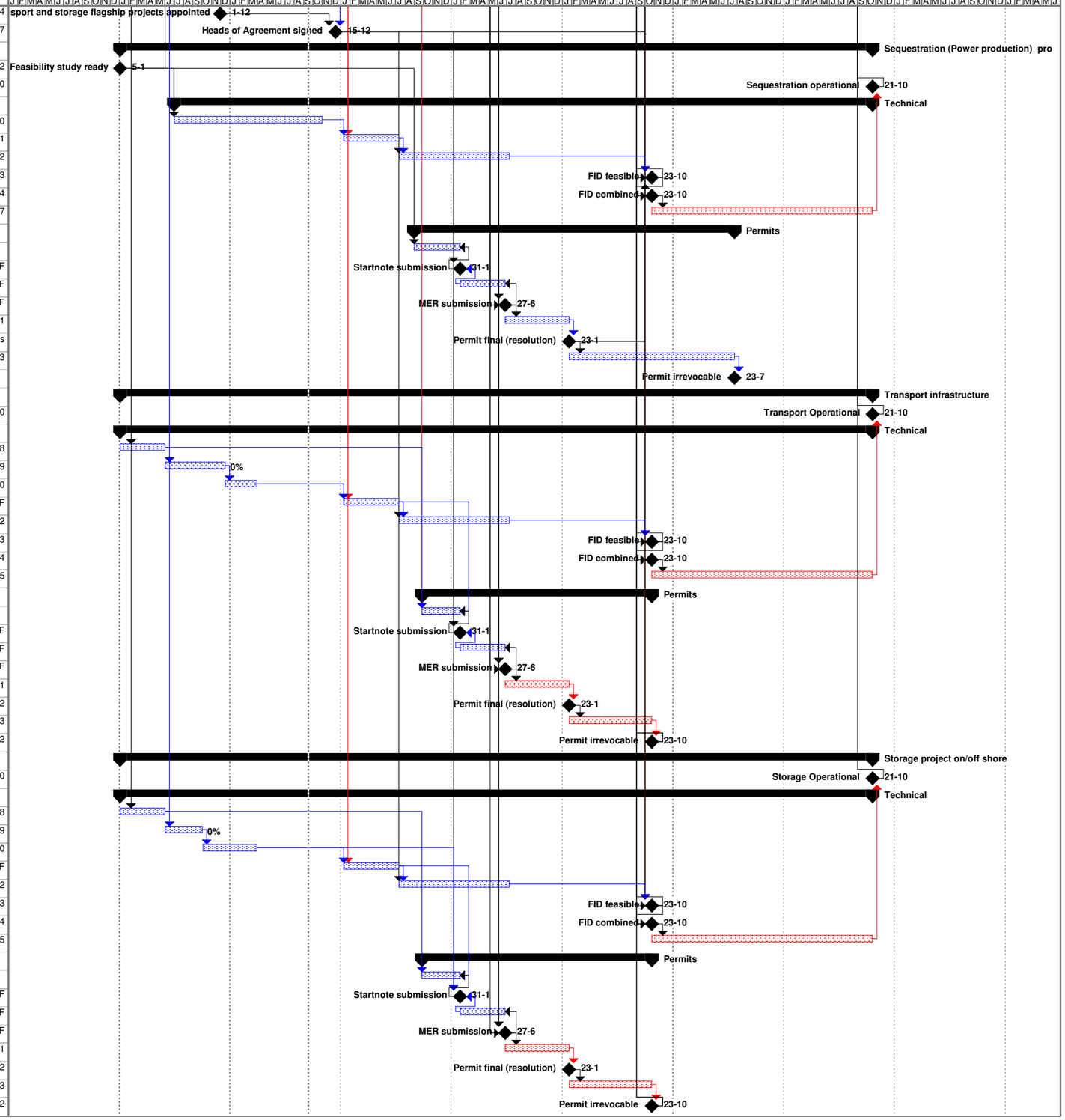
Large Scale CCS Demonstration Projects

ID	Task Name	Duration	Start	Finish	Predecessors	Successors
63	Operational parties transport and storage flagship projects appoi	0 days	Tue 1-12-09	Tue 1-12-09		64
64	Heads of Agreement signed	0 days	Wed 15-12-10	Wed 15-12-10	62;63	9;79;71;91;111;77
65	**Sequestration (Power production) project**	**1773 days**	**Mon 5-1-09**	**Wed 21-10-15**		
66	Feasibility study ready	0 days	Mon 5-1-09	Mon 5-1-09		69;76;62
67	Sequestration operational	0 days	Wed 21-10-15	Wed 21-10-15	74	60
68	**Technical**	**1646 days**	**Wed 1-7-09**	**Wed 21-10-15**		
69	Concept selection	349 days	Wed 1-7-09	Mon 1-11-10	66	70
70	Concept selection final	130 days	Wed 12-1-11	Tue 12-7-11	69;53	71
71	Detailed design	260 days	Wed 13-7-11	Tue 10-7-12	64;70	72
72	FID feasible	0 days	Wed 23-10-13	Wed 23-10-13	71;50;81FS+65 days	59;73
73	FID combined	0 days	Wed 23-10-13	Wed 23-10-13	72;59	74
74	Materials, construction & commissioning	520 days	Thu 24-10-13	Wed 21-10-15	73	67
75	**Permits**	**755 days**	**Thu 1-9-11**	**Wed 23-7-14**		
76	Startnote (permit application) preparation	108 days	Thu 1-9-11	Tue 31-1-12	66;77SF	
77	Startnote submission	0 days	Tue 31-1-12	Tue 31-1-12	64;78SF	76SF
78	MER preparation	107 days	Tue 31-1-12	Wed 27-6-12	79FF	77SF
79	MER submission	0 days	Wed 27-6-12	Wed 27-6-12	64;58	80;78FF
80	Permit procedure	150 days	Thu 28-6-12	Wed 23-1-13	79	81
81	Permit final (resolution)	0 days	Wed 23-1-13	Wed 23-1-13	80	82;72FS+65 days
82	Objection and appeal (RCR regulation)	390 days	Thu 24-1-13	Wed 23-7-14	81	83
83	Permit irrevocable	0 days	Wed 23-7-14	Wed 23-7-14	82	
84	**Transport infrastructure**	**1773 days**	**Mon 5-1-09**	**Wed 21-10-15**		
85	Transport Operational	0 days	Wed 21-10-15	Wed 21-10-15	94	60
86	**Technical**	**1773 days**	**Mon 5-1-09**	**Wed 21-10-15**		
87	Feasibility study global	106 days	Mon 5-1-09	Mon 1-6-09	1	96;62;88
88	Feasibility study final	142 days	Tue 2-6-09	Wed 16-12-09	87	89
89	Concept selection	75 days	Thu 17-12-09	Wed 31-3-10	88	90
90	Concept selection final	130 days	Wed 12-1-11	Tue 12-7-11	53;89	91;96FF
91	Detailed design	260 days	Wed 13-7-11	Tue 10-7-12	90;64	92
92	FID feasible	0 days	Wed 23-10-13	Wed 23-10-13	91;50;103	59;93
93	FID combined	0 days	Wed 23-10-13	Wed 23-10-13	92;59	94
94	Materials, Construction and commissioning	520 days	Thu 24-10-13	Wed 21-10-15	93	85
95	**Permits**	**542 days**	**Tue 27-9-11**	**Wed 23-10-13**		
96	Startnote (permit application) preparation	90 days	Tue 27-9-11	Tue 31-1-12	10;87;90FF;97SF	
97	Startnote submission	0 days	Tue 31-1-12	Tue 31-1-12	64;98SF	96SF
98	MER preparation	107 days	Tue 31-1-12	Wed 27-6-12	99FF	97SF
99	MER submission	0 days	Wed 27-6-12	Wed 27-6-12	13;64;58	100;98FF
100	Permit procedure	150 days	Thu 28-6-12	Wed 23-1-13	99	101
101	Permit final (resolution)	0 days	Wed 23-1-13	Wed 23-1-13	100	102
102	Objection and appeal (RCR regulation)	195 days	Thu 24-1-13	Wed 23-10-13	101	103
103	Permit irrevocable	0 days	Wed 23-10-13	Wed 23-10-13	102	72;92
104	**Storage project on/off shore**	**1773 days**	**Mon 5-1-09**	**Wed 21-10-15**		
105	Storage Operational	0 days	Wed 21-10-15	Wed 21-10-15	114	60
106	**Technical**	**1773 days**	**Mon 5-1-09**	**Wed 21-10-15**		
107	Feasibility study global	106 days	Mon 5-1-09	Mon 1-6-09	1	62;116;108
108	Feasibility study final	89 days	Tue 2-6-09	Fri 2-10-09	107	109
109	Concept selection	128 days	Mon 5-10-09	Wed 31-3-10	108	117;110
110	Concept selection final	130 days	Wed 12-1-11	Tue 12-7-11	53;109	111;116FF
111	Detailed design	260 days	Wed 13-7-11	Tue 10-7-12	110;64	112
112	FID feasible	0 days	Wed 23-10-13	Wed 23-10-13	7;111;64;49;50;25;1	59;113
113	FID combined	0 days	Wed 23-10-13	Wed 23-10-13	112;59	114
114	Materials, Construction and commissioning	520 days	Thu 24-10-13	Wed 21-10-15	113	105
115	**Permits**	**542 days**	**Tue 27-9-11**	**Wed 23-10-13**		
116	Startnote (permit application) preparation	90 days	Tue 27-9-11	Tue 31-1-12	107;110FF;117SF	
117	Startnote submission	0 days	Tue 31-1-12	Tue 31-1-12	64;109;118SF	116SF
118	MER preparation	107 days	Tue 31-1-12	Wed 27-6-12	119FF	117SF
119	MER submission	0 days	Wed 27-6-12	Wed 27-6-12	19;64;58	120;118FF
120	Permit procedure	150 days	Thu 28-6-12	Wed 23-1-13	119	121
121	Permit final (resolution)	0 days	Wed 23-1-13	Wed 23-1-13	120	122
122	Objection and appeal (RCR regulation)	195 days	Thu 24-1-13	Wed 23-10-13	121	123
123	Permit irrevocable	0 days	Wed 23-10-13	Wed 23-10-13	122	72;112



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