



SCCS CO₂-EOR JIP

Legal Status of CO₂ – Enhanced Oil Recovery

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This report is concerned with international, European Union and national legal aspects of Enhanced Oil Recovery and Carbon Capture and Storage. The information in the report is provided with the understanding that the authors are not engaged in providing legal advice, and it should not be used as a substitute for professional legal advice.

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EXECUTIVE SUMMARY

1. This report is concerned with core environmental and energy law requirements in the United Kingdom that will apply to commercial enhanced oil recovery (EOR) operations using CO₂. Operations that combine EOR with long-term storage of Carbon Dioxide may in the current depressed emissions trading market prove to be vital in securing commercial investment for CCS, and there needs to be a clear and stable regulatory framework if investment is not to be jeopardised. The report identifies some important problem areas and ambiguities in the current legislation which should be addressed.

2. In contrast to jurisdictions such as the United States EOR operations in the United Kingdom in the foreseeable future are likely to be offshore and will use CO₂ acquired from power stations. There have been many changes in legal and regulatory frameworks in recent years at international and European Union (previously known as European Community) level to accommodate Carbon Capture and Storage for greenhouse gas abatement purposes, but less focus on EOR operations.

3. The main international marine conventions of relevance are the London Protocol and the OSPAR Convention. The London Protocol does not expressly mention EOR, but is unlikely to apply to any injection of CO₂ during EOR operations because of the Protocol's definitions of 'dumping'. Any storage taking place following completion of EOR operations will need to comply with the Protocol's provisions on CCS storage. Similarly, the OSPAR Convention is unlikely to apply to any injection during EOR operations.

4. The Preamble to the EU CCS Directive states that Enhanced Hydrocarbon Recovery (EHR) is not in itself included in the scope of this Directive, but that the provisions of the Directive will apply where EHR is combined with geological storage of CO₂. Under general principles of EU law, a Preamble by itself cannot create an exemption, but acts as an aid to interpretation. One interpretation of the Directive is that it will apply to any injected CO₂ during EOR operations which is not recycled, but it is more convincing to interpret the Directive as applying only to the storage of CO₂ following the cessation of EOR operations.

5. There are significant problems concerning the application of the Directive's requirements on acceptance criteria for CO₂ streams where EOR operations are involved but combined with long-term storage. A strict interpretation of the Directive's provisions could severely inhibit the EOR operation combined with CCS storage. The drafting is probably due to a failure at the time the legislation was developed to fully appreciate what was involved in an EOR combined operation, and it is recommended that the issue be addressed in any revision of the Directive. Current Guidelines on acceptance criteria do not address this issue, and the European Commission should also be encouraged to develop guidance on the subject.

6. CCS capture, transport and storage operations are covered by the EU Emissions Trading Scheme. Capture installations secure a benefit in that they do not need to account for CO₂ allowance relating to CO₂ transported to a CCS site under the Directive. Pure EOR operations cannot secure the benefits of the Emissions Trading Scheme. Under current regulations, the better interpretation is that any transport of CO₂ by ship even where used for long-term storage will not be able to secure the benefits, unless the Member State secures case by case agreements from the European Commission. This does not seem a satisfactory long-term solution. It is unclear whether the general exclusion of transport by ships (rather than pipelines) was deliberate or due to a legislative oversight, but it is recommended that in any revision of the Directive, the issue is addressed.

7. Under the CCS Directive, CO₂ injected into a CCS site for long-term storage is excluded from EU waste legislation. For a combined operation, CO₂ should fall within the waste exclusion since in such an operation one of the purposes of capture and transporting will be for long-term storage, even though it is used for EOR operations in the intermediate period. Nevertheless, there is potential ambiguity here, and it would be preferable to secure a more clearly worded exclusion to encompass CO₂ captured and transported for a combined operation.

8. CO₂ used in pure EOR operations cannot fall within the exemption. Although CO₂ emanating from a plant is therefore potentially waste in law, it is very likely that if it is transformed into a form suitable for EOR operations it will have fulfilled the criteria for ceasing to be waste in law while being used during

EOR operations. End of waste criteria for particular types of waste can be developed at European Union level but, in the meantime, Member States are permitted to make their own decisions applying the basic principles of EU waste law. It is recommended that guidance on this issue should be developed initially by the UK Government.

9. The CCS Directive requirements have been transposed into UK law by the Energy Act 2008 and regulations made under it. These regulations do not apply to CO₂ injected during EOR operations, unless the Secretary of State makes an order to that effect. He would be obliged to do so where permanent storage within the meaning of the Directive takes place. Pure EOR operations are covered by licenses under the Petroleum Act 1998 and there appear to be no major inconsistencies between the regimes.

10. General principles of civil liability for damage caused by the escape of CO₂ following EOR operations are primarily derived from judicial made case law in the United Kingdom. Trespass is unlikely to be applicable where indirect damage is caused through pressure, but otherwise the standard torts of nuisance and negligence will be relevant. Compliance or non-compliance with a permit will be relevant to a negligence claim, though not conclusive.

11. A number of other jurisdictions, both within the EU and outside the EU, have been examined. Within the EU Member States studied, pure EOR operations are generally licensed under different legal regimes from those applicable to the long-term storage of CO₂. The dividing line between the two types of operations is clearly not always easy to determine, and the US Environmental Protection Agency probably has the most developed policy and guidelines in this context.

1. Overall aim of the project

This report examines key issues concerning the application of current law to the injection of CO₂ associated with enhanced oil recovery operations. Its focus is on the applicable law within the United Kingdom including international conventions to which the UK is a party and EU legislation, particularly the EU CCS Directive (2009/31/EC), although some comparison with other jurisdictions has been included.

The main focus of the EU legislation has been concerned with the long-term storage of CO₂ as an element of climate change strategies, and there are significant ambiguities as to how EOR operations and accompanied CO₂ injection fit into this legislation. In contrast to countries such as the United States, which has a long experience of EOR operations on land, any EOR operations in the foreseeable future in the United Kingdom are likely to take place offshore. The report, therefore, does not deal with legal issues related to onshore activities such as property rights and the private ownership of pore space. It will consider the key principles of liability (under trespass, nuisance, etc.) where other interests could be affected by EOR operations offshore. The report is not intended to provide an analysis of every area of law which might have a bearing on any industrial activity (e.g. health and safety legislation, contractual and commercial law relating to the acquisition of CO₂), nor will it deal with areas such as Competition Law which might be relevant in certain scenarios. The main focus will be on core areas of public regulatory law, especially those concerning energy and environmental protection. Throughout, the aim is to identify those aspects of the law where EOR appears to raise distinctive questions – where, for example, operations clearly fall within the scope of the CCS Directive or the Emissions Trading Scheme the analysis will not repeat all the requirements under those Directives unless there are peculiarities relating to EOR.

There have been many changes in legal and regulatory frameworks in recent years to accommodate CCS, as many countries, including the UK, have been supportive of its development. At international level there have been changes to the 1996 Protocol to the 1972 London Dumping Convention, 1992 OSPAR Convention for the Protection of the Marine Environment of the North East Atlantic, the 2009 European Community (EC) Directive on geological storage of carbon dioxide (EU CCS Directive), which applies to the UK as a member state of the European Union; and the Energy Act 2008 in the United Kingdom. The removal of barriers at national, European and international levels to allow CCS projects in certain circumstances has also made certain aspects of CO₂-EOR much clearer. But within Europe there has been very little written on EOR alone. This report was in part commissioned because it is not fully understood whether current legal and regulatory frameworks will create barriers to EOR involving CO₂.

2. Terminology

“Enhanced Oil Recovery” is the term long used in jurisdictions such as the United States, but EU legislation refers to “Enhanced Hydrocarbon Recovery” (EHR) to make it clear that it encompasses the recovery of gas and other hydrocarbons as well as oil. Since the EU legislation has such an important bearing on the focus of the report, we will normally refer to EHR, unless the context requires otherwise. In contrast to current US practice, our understanding is that there are no suitable sources of natural CO₂ for prospective EHR in the United Kingdom, and CO₂ used will be acquired from power stations or other industrial sources. This has a bearing on the acceptance criteria for CO₂, and its status in law.

3. Injection and Storage of CO₂

This report is concerned with the application and interpretation of law rather than providing a detailed technical analysis of EHR operations and CO₂ storage. Nevertheless, an understanding of what is factually involved in any given situation will often be essential to resolving legal issues in practice. In a

recent study commissioned by the Global Carbon Capture and Storage Institute,¹ Philip Marston has usefully identified five different storage scenarios that can assist in identifying the current application and appropriateness of regulatory frameworks:

- (a) **Incidental storage of CO₂ during EHR operations.** This refers to the CO₂ that accumulates in the strata during the injection of CO₂. EHR operators recycle as much CO₂ as possible for further injection, but our understanding is typically between 30% and 50% may be left in the strata following initial injection, and that there is a considerable time-lapse before any remaining CO₂ works through for recovery (typically several years). When recovered the CO₂ will be mixed with other substances, including, *inter alia*, methane, oil and brine. In this report we refer to this as 'pure' EHR operations.
- (b) **Incremental storage during EHR operations.** Where there is no commercial value in the storage of CO₂, operators will limit the amount of CO₂ injected to that required to maximise economic returns from hydrocarbon production, but if there is such a value (as there should be under current EU policy), production techniques could '*maximize the quantity of CO₂ injected for a given amount of oil production*'.²
- (c) **Incremental storage following termination of EHR operations.** CO₂ can be injected in what is now a depleted hydrocarbon site for emission reduction purposes, with the result that the CO₂ contained in the site results from both EHR operations and emissions reduction purposes. Where the eventual use of the site for CCS storage is planned from the beginning of the EHR project, (the likely scenario for current UK EHR projects), we refer to it as a "combined" EHR/CCS operation.
- (d) **Storage during buffering or balancing operations.** This refers to the "*need to accommodate variations between CO₂ supply and injection operations*",³ and could encompass stacked storage in non-hydrocarbon bearing saline formations where excess CO₂ is stored for use where CO₂ supplies fall below the quantity needed for EHR purposes.
- (e) **Long-term CCS storage for emissions reduction purposes.** This has been the main focus of the EU CCS Directive.

4. International Conventions⁴

4.1 1996 London Protocol⁵

The London Protocol was agreed in order to modernise the 1972 Convention on the Prevention of Marine Pollution by introducing a general prohibition on the dumping of wastes, except for those categories specified in the Protocol (the so-called 'reverse list') which require a permit to be issued by national authorities. The definition of dumping in Art 1.4.1 includes "*any storage of wastes and other matters in the seabed and the subsoil thereof from vessels, aircraft, platforms or other man-made structures at sea,*" but Art 1.4.3 then excludes from this definition a number of activities, including, "*The disposal or storage of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of seabed mineral resources.*"

¹ Philip Marston (2013) *Bridging the Gap – An Analysis and Comparison of Legal and Regulatory Frameworks for CO₂-EOR and CO₂-CCS* (Global Carbon Capture Storage Institute, 2013)

² *Ibid* p 144.

³ *Ibid* p 144.

⁴ For a recent review see Chiara Armeni 'Legal Developments for Carbon Capture and Storage under International and Regional Marine Legislation' in Havercroft, Macrory and Stewart *Carbon Capture and Storage – Emerging Legal and Regulatory Issues* (Hart Publishing 2011).

⁵ 1996 Protocol to the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters. There are challenging legal issues concerning the application of the 1972 London Dumping Convention to EHR activities – notably, the extent to which it applies to sub-seabed activities, does not apply to discharges from pipelines, and whether acquired CO₂ would fall within the category of 'industrial waste', a prohibited substance under Annex I added in 1996. However, its relevance is now confined to countries that have not ratified the London Protocol. EU Member States and Norway have signed the Protocol, and the London Dumping Convention is therefore not considered further in this Report.

Three aspects of the Protocol can be noted initially. First, the Convention's definition of "waste and other matter" is extremely broad – "material and substance of any kind, form or description" (Art 1.8). This would encompass CO₂ acquired from natural or industrial sources, and since the Convention definition contains no requirements that the substance is waste in law or has been discarded, legal arguments as to whether CO₂ from industrial sources to be used as part of the EHR operations is legally a "waste" or not (see the discussion under EU law below) are not relevant.

Second, the definition of dumping in the Protocol in Art 1.4.1 does not explicitly refer to the wastes and other matters coming directly from pipelines from land, although it is arguable that "other man-made structures at sea" is a broad enough concept to include pipelines.

Third, if the injection of CO₂ associated with EHR operations falls within the Art 1.4.3 exclusion, none of the Protocol's restrictions (including the export of waste and other matter) will apply. According to the CM Legal and Related Issues Working Group on CO₂ Sequestration, this exemption would encompass CO₂ injection associated with EHR activities.⁶ However, the exemption does not apply if the main purpose of the CO₂ injection is the permanent storage of the CO₂. In this case, the activity would fall within the new category of Annex I substances that may be considered for dumping introduced by amendments to the Protocol in 2006 - "Carbon dioxide streams from carbon dioxide capture processes for sequestration." According to Annex 1 para 4, such CO₂ streams may only be considered for dumping where (i) disposal is into a sub-seabed geological formation; (ii) they consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; provided no wastes or other matter are added for the purpose of disposing of those wastes or other matter.

Art 6 of the Protocol prohibits the "export of wastes or other matter to other countries for dumping or incineration at sea." In the absence of any definition of 'export' in the Protocol, the IMO Legal and Technical Working Group⁷ regarded export as meaning "any movement from one Contracting Party to another country for disposal in that other country regardless of any commercial basis for that transfer"⁸. This prohibition was considered to encompass the deliberate transfer of CO₂ from a Contracting Party to any other country before injection, whether a Contracting Party or not. The Group considered that any unexpected transboundary migration of CO₂ did not fall within the prohibition as it did not involve an 'export', but left open the question of an intended migration. There is a strong argument that if such a migration is known to be the inevitable or probable consequence of injection, then an export is involved, but there is no conclusive view on this.

An amendment to Art 6 of the Protocol, proposed by Norway, was adopted on 30 October 2009 to allow the export of CO₂ streams for disposal in accordance with Annex I, provided an agreement has been made by the countries concerned, including the allocation of permitting responsibilities consistent with the Protocol and other relevant international law. The amendment does not, however, enter into force until two-thirds of the contracting parties have accepted it (currently 27 countries). At present only the United Kingdom and Norway have ratified the amendment and it seems unlikely that in the foreseeable future it will reach the relevant number to enter into force.

In 2011, the International Energy Agency (IEA) suggested some options under international law to facilitate transboundary transfer of CO₂ for offshore storage, pending formal entry into force of the amendment to Art 6 of the London Protocol.⁹ These are: an interpretative resolution¹⁰; the provisional application of the amendment¹¹; a subsequent agreement¹²; a modification – or suspension - of the operation of relevant aspects of the Protocol between two or more contracting parties.¹³

⁶ Report of the 27th Consultative Meeting 2005.

⁷ Report of the 1st Meeting of the Legal and Technical Working Group on Transboundary CO₂ sequestration issues (3 March 2008) IMO Doc LP/CO₂ 1/8.

⁸ Ibid para 3.9.

⁹ International Energy Agency, Carbon Capture and Storage and the London Protocol – Options for Enabling Transboundary CO₂ Transfer, OECD/IEA (2011)

¹⁰ Art 31 Vienna Convention on the Law of Treaties (1969) (hereinafter VCLT)

¹¹ Art. 25 VCLT

¹² Art 30 VCLT

¹³ Arts 41 and 58 VCLT

It is the authors' view that all these options are themselves problematic from a legal point of view. As the prohibition under Article 6 was interpreted as extending to transport of CO₂, requiring formal amendment, an interpretative resolution to the contrary does not seem viable. A subsequent agreement on the same subject matter would still require consensus of the Parties and formal entry into force.¹⁴ As for a modification/suspension of the operation of Art 6, this possibility must be provided for (or at least not prohibited) by the Protocol, and compatible with its object and purpose, as well as with the rights of other parties. The latter conditions seem difficult to fulfill in this case. In the case of provisional application, an express provision to that effect is needed within the Protocol (or a part of it), provided that "part of it" can also extend to an amendment. Such provision is absent both from the London Protocol and from its 2009 amendment. The recourse to a Party resolution to overcome this limitation remains controversial. Given that there remain difficulties in securing the necessary number of countries to ratify the amendments, it will remain largely a matter of political and policy judgment whether individual countries in the meantime decide to ignore the current limitations on transfrontier movements of wastes. Our argument here is that unless and until the amendment comes into force, any such action will be suspect under international law.

CO₂ injection associated with EHR operations that falls within the Art 1.4.2 exemption will not be caught by the Art 6 prohibition. It will be a matter of fact and degree to determine for any particular operation whether the CO₂ storage that occurs is an inevitable result of EHR operations or is conducted for other reasons. Certainly it seems unlikely that an operator could at the same time claim under international law that the exemption applies, but that under EU law the site is a CO₂ storage site in order to gain the commercial advantages of being included within the Emissions Trading regime.

4.2 1992 OSPAR Convention¹⁵

The Convention contains prohibitions and obligations concerning three key sources contained in Annexes I to III: pollution from land-based sources; pollution by dumping or incineration; and pollution from offshore sources. Each is a self-contained legal regime. The most relevant part of the Convention for current offshore EHR operations is Annex III(3) which prohibits the dumping of wastes and other matters from offshore installations, but as with the London Protocol, the Convention excludes certain activities from the definition of dumping. These include at Art 1(g):

(i) the disposal in accordance with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, or other applicable international law, of wastes or other matter incidental to, or derived from, the normal operations of vessels or aircraft or offshore installations other than wastes or other matter transported by or to vessels or aircraft or offshore installations for the purpose of disposal of such wastes or other matter or derived from the treatment of such wastes or other matter on such vessels or aircraft or offshore installations; (ii) placement of matter for a purpose other than the mere disposal thereof, provided that, if the placement is for a purpose other than that for which the matter was originally designed or constructed, it is in accordance with the relevant provisions of the Convention.

There is some ambiguity whether CO₂ injection associated with EHR operations is encompassed by either of these exemptions. Art 1(g)(i) does not include waste or other matter transported to offshore installations "for the purpose of disposal", and, although the motive for disposal may be for enhanced hydrocarbon recovery, and incidental to the normal operation of an offshore installation, nevertheless it will have been transported with the knowledge that the consignment, or at least a substantial proportion of the consignment, will be disposed of under the seabed. However, the OSPAR Group of Jurists, in 2004, concluded that placements of CO₂ for the purposes of EHR could be regarded as part of the normal operation of an offshore installation and were thus excluded from the Convention.

¹⁴ The recourse of a subsequent agreement through an additional treaty "on the same subject matter" has been interpreted as implying "compatibility" between the content and avoid conflicts between provisions between the early and the later treaty. To our view, incompatibility would inevitably arise in this case. See O. Door, K. Schmalenbach, *Vienna Convention on the Law of the Treaties – A commentary*, Springer Heidelberg Dordrecht, London, New York, (2012).

¹⁵ 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic.

Even if the Art 1(g)(i) exclusion does not apply, Art 2 of Annex III goes on to state that the prohibition of dumping from offshore installations does not apply to 'discharges or emissions from offshore installations,' though such discharges will require permits from national authorities. In its 2004 Report the OSPAR Group of Jurists noted that:

Where CO₂ is injected in a genuine attempt to facilitate or improve the production of hydrocarbons, it should be treated on the same basis as any other substance used for production purposes. This applies regardless of the source of the CO₂. It would, of course, be subject to meeting the requirements of any relevant decisions, and to taking into account any relevant recommendations, under the OSPAR Convention relating to the use and discharge of chemicals offshore.¹⁶

Unlike the London Protocol, OSPAR contains no general prohibition against the export of wastes or other materials to other countries, whether Parties or not.

The Convention was amended in 2007 to permit the storage of CO₂ in geological formations under the seabed. This was accompanied by a Decision of the Parties confirming the application of OSPAR Guidelines for Risk Assessment and Management of Storage of CO₂ Streams in Geological Formations and the requirement of national permits to "ensure the avoidance of significant adverse effects on the marine environment, bearing in mind that the ultimate objective is permanent containment of CO₂ streams in geological formations."¹⁷ On 23 July 2011, sufficient parties had agreed the amendment for it to enter into force for those countries that had ratified (Norway, Germany, United Kingdom, Spain, European Union, Luxembourg, Denmark, Netherlands). The provisions do not deal explicitly with storage associated with EHR recovery, but again it will be a matter of fact and degree to determine whether storage is associated or whether the operations fall within the exemptions.

4.3 1989 Basel Convention¹⁸

Art 4 of the Basel Convention gives Parties the right to prohibit the import of hazardous wastes or "other wastes" (defined in Annex II to include only household waste and residues from the incineration of household waste). Parties may not export such wastes to those countries and, where such prohibition exists, must obtain the prior consent of the importing country. Transit states must also give consent. Hazardous waste or "other" wastes may not be exported to or imported from a non-party.

The Convention does not explicitly deal with potential transboundary movements of CO₂ connected with CCS or EHR operations, but a number of features should be noted. The definition of hazardous wastes includes wastes from certain processes or containing specific substances, but CO₂ from generating or other industrial operations is not listed within the Annex. However, the definition goes on to include wastes that are "defined as or considered to be hazardous waste by the domestic legislation of the Party of export-import or transit." The United Kingdom has made no such classification and, as far as we know, no other European country has done so. Unlike the London Protocol and the OSPAR Convention, the Basel Convention restricts its ambit to wastes, defined as "substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law" (Art 2). This means that questions concerning the legal status of acquired CO₂ and whether it is a by-product or has ceased being waste, become significant were CO₂ to be treated as hazardous (see further section 7 below). The Convention principles on this topic will be self-standing, but in practice are likely to be strongly influenced by the more developed case law and legislation of the European Union since the basic definitions are the same. Finally, unlike the London Protocol, there is no absolute ban on export or transboundary movements between Parties to the Convention, and they may mutually agree to allow such activity to take place, applying the principles contained in the Convention.

¹⁶ Report from the Group of Jurists and Linguists on Placement of Carbon Dioxide in the OSPAR Maritime Area, para 22.

¹⁷ OSPAR Decision 2007/2 on the Storage of Carbon Dioxide Streams in Geological Formations 3.2.

¹⁸ 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

5. EU CCS Directive¹⁹

5.1 The Directive and its application to EHR operations

The Directive (2009/31/EC) provides the core legal framework concerning the long term storage of CO₂ within the European Union, both onshore and offshore, and covers such issues as site selection, exploration and storage permitting, CO₂ stream acceptance criteria, financial responsibility, closure, and transfer of responsibilities. The Directive links in CO₂ storage into other areas of EU law by making appropriate amendments to legislation, including environmental assessment, environmental liability and the emissions trading regime. A core question is whether the Directive applies to the injection and storage of CO₂ involved in EHR operations. None of the substantive provisions of the Directive mention EHR but Preamble 20 states that:

Enhanced Hydrocarbon Recovery (EHR) refers to the recovery of hydrocarbons in addition to those extracted by water injection or other means. EHR is not in itself included in the scope of this Directive. However, where EHR is combined with geological storage of CO₂, the provisions of this Directive for the environmentally safe storage of CO₂ should apply. In that case, the provisions of this Directive concerning leakage are not intended to apply to quantities of CO₂ released from surface installations which do not exceed what is necessary in the normal process of extraction of hydrocarbons, and which do not compromise the security of the geological storage or adversely affect the surrounding environment. Such releases are covered by the inclusion of storage sites in Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community which requires surrender of emissions trading allowances for any leaked emissions.

The Preamble itself contains some ambiguities in interpretation, but from a legal perspective the initial question is the status of such a Preamble in Community law.²⁰

5.2 Legal status of the Preamble

It is clear that Preambles provide an important aid to interpreting the provisions of a Directive but cannot themselves provide substantive rules or exemptions. As Scott and Rajamani noted:

Preambles included in EU legislation do not have binding legal force and they cannot serve as a ground for derogating from the main body of the relevant act. Nonetheless, where there is no contradiction between the preamble and the main body of the directive, the preamble may be used to 'cast light on the interpretation to be given to a legal rule'.²¹

The same point has been made by the European Court of Justice on a number of occasions:

"It must be stated that the preamble to a Community act has no binding legal force and cannot be relied on as a ground for derogating from the actual provisions of the act in

¹⁹ European Community Directive on the Geological Storage of CO₂ 2009/31/EC.

²⁰ This type of lengthy Preamble which permeates Community legislation is not a feature of UK legislation where the closest similarity is the Long Title to an Act of Parliament. The "Whereas" sections of a Preamble are known as Recitals and 'set out the reasons' for the substantive contents of the legislation; European Commission Publications Office 2013 *Interinstitutional Style Guide: Structure of an Act*.

²¹ Scott J and Rajamani L. EU 'Climate Change Unilateralism' *European Journal of International Law* 2013 1-19 p 17.

question.”²²

*“Whilst a recital in the preamble to a regulation may cast light on the interpretation to be given to a legal rule, it cannot in itself constitute such a rule.”*²³

The Preamble appears to state an exclusion of EHR from the scope of the Directive but in law cannot do so. In any event, the Directive contains explicit provisions concerning exclusions in Art 2(1) and a Court could judge this to be the correct place if an activity were to be totally exempted from the Directive.

Since there are no explicit substantive provisions of the Directive relating to EHR, the preamble has somewhat of an orphan status. This can be explained by considering its history. The European Commission’s original proposal for the CCS Directive²⁴ did not refer to EHR and the subject was first introduced by the European Parliamentary Committee on the Environment, Public Health and Food Safety during the Parliamentary procedures concerning the proposed Directive.²⁵ A new recital in the Preamble was introduced: *“Enhanced hydrocarbon recovery (the recovery of hydrocarbon additional to that produced naturally by fluid injection or other means) should be excluded from the scope of this Directive”*.

More importantly a proposed specific exception in Art 2(1) was introduced providing the linkage between the Recital and the substantive provisions of the Directive, stating that, *“enhanced hydrocarbon recovery shall be excluded from the scope of this Directive”*.²⁶ The Opinion of the Committee on Industry, Research and Energy did not refer to EHR. However, during the full debate of the European Parliament in December 2008, there was some vigorous opposition to the proposed exclusion led by Green MEP’s.²⁷ Following that debate, the exclusion appears to have been dropped, and the European Parliament position, adopted at first reading on 17 December 2008, did not contain any of the amendments other than a more extended version of the proposed Recital 14a, corresponding to what is now Recital 20 of the CCS Directive. The fact that the recital originally referred to a formal exception within the body of the Directive, which no longer exists helps to explain its rather abandoned position.

5.3 EHR and storage

The Preamble therefore has interpretative value but cannot create an exemption in itself. The Directive itself applies to the ‘geological storage’ of CO₂ (Art 1.), a term defined in Art 3(1) to mean, *“injection accompanied by storage of CO₂ streams in underground geological formations”*. This is not especially helpful since the definition itself uses the term ‘storage’ which is not defined. EHR operations inevitably leave a proportion of the injected CO₂ in the hydrocarbon bearing strata during recovery operations, and an expansive interpretation of the Directive would argue that this is storage subject to the full requirements of the Directive. The definition simply refers to *‘injection accompanied by storage’*. There is no indication in the Directive that the storage that takes place must only be motivated by the need for climate change emissions reductions, simply that storage has taken place. The implication of this

²² C 162/97 19 Nov 1998 *Nilson Hagelgren and Arborn*, para 54

²³ C 215/88 13 July 1989 *Fleischhandels-Gmb and Bundesanstalt für landwirtschaftliche*.

²⁴ Proposal for a Directive of the European Parliament and of the Council on Carbon Capture and Storage (COM 2008 (18) final), of 23 January 2008.

²⁵ Report of the Committee on the Environment, Public Health and Food Safety on the Proposal, of 16 October 2008.

²⁶ There was a proposal to strengthen this exemption to make it absolutely clear that EHR was excluded by changing the wording to *“This Directive shall not apply to the geological storage of CO₂ or gas mixtures containing CO₂ being injected for the purpose of and as a measure to increase the exploitation of hydrocarbons in the storage site”*.

²⁷ e.g. *“I should like to congratulate the rapporteur, though, on the introduction of a 20-year liability period and a fund which will finance the monitoring of closed sites for 30 years. This is offset, however, by the fact that this directive does allow CO₂ to be pumped into the ground in order to recover more gas and oil, a process known as enhanced oil recovery. This is a very bizarre element of the climate package, because this process ensures, naturally, that more CO₂ is emitted. Thanks to the Davies Fund, therefore, oil companies can now benefit from incentive measures for carbon capture and storage (CCS) to use, and exhaust, their oil fields for longer. Shell will be satisfied, the environment will not. That is why my group will be voting ‘no’.”* (Kathalijne Maria Buitenweg, Verts/ALE group) (European Parliament Debates 16 December 2008).

interpretation is that all EHR sites would have to satisfy the requirements of the Directive, including site integrity, financial security and so on.

We are not convinced that this interpretation is convincing when looking at the overall aims and context of the Directive. It would deprive the Preamble of any effective meaning since all EHR operations are accompanied by storage in this broad sense. It would mean that all pure EHR operations become storage sites under the Directive, are eligible for inclusion with the emissions trading regime, and those capturing do not have to surrender allowances. It seems unlikely that it was the intention of the legislature to subsidise pure EHR operations in this way.²⁸

A preferable interpretation would be that the concept of storage in the Directive is not intended to encompass the injection and storage of CO₂, which is the inevitable or ordinary result of EHR operations. This would include any temporary storage connected with buffering operations, together with any injection of CO₂ that can be said to benefit the recovery operation.²⁹ Once, however, one moves into incremental storage both during and after recovery operations (as characterised in Section 3 above), then the requirements of the Directive would apply. In such a transitional phase there may be challenges in identifying and accounting for CO₂ injected as a direct result of EHR operations and injected for storage purposes (necessary for qualification under the emissions trading regime), but this is an inevitable result of the changed nature of the operation. In practice, at present at least, it seems likely that any proposed sites for UK EHR operations will in fact be already selected as CCS storage sites in accordance with the Directive, and these transitional issues or the need to secure exemption from the Directive are not an immediate issue.

Support for this interpretation is found in the UK legislation which has implemented the Directive. The detailed regulations are made under the provisions of the Energy Act 2008. Section 17 requires a licence for use of the territorial sea or waters in a Gas Importation or Storage Zone “*for the storage of carbon dioxide (with a view to its permanent disposal, or as an interim measure prior to its permanent disposal)*” (authors’ emphasis). While CO₂ is being recycled during EHR operations or held in a buffer store for such use, there is no intention of permanent disposal. The phrase ‘permanent disposal’ is derived from references to the concept in a number of the preambles and in the Art 1.2 statement of the purpose of environmentally safe storage of CO₂.

5.4 Acceptance criteria for injection streams

Art 12 of the Directive contains requirements concerning the acceptance of CO₂ streams. It is expressed in a fairly complex way with an overall standard followed by qualifications, which are themselves subject to limitations:

A CO₂ stream shall consist overwhelmingly of carbon dioxide. To this end, no waste or other matter may be added for the purpose of disposing of that waste or other matter. However, a CO₂ stream may contain incidental associated substances from the source, capture or injection process and trace substances added to assist in monitoring and verifying CO₂ migration. Concentrations of all incidental and added substances shall be below levels that would: (a) adversely affect the integrity of the storage site or the relevant transport infrastructure; (b) pose a significant risk to the environment or human health; or (c) breach the requirements of applicable Community legislation.

This is clearly confined to storage sites within the scope of the Directive, and, assuming that any injection and deposit associated with pure EHR operations does not fall within the scope of the Directive, then the

²⁸ On the other hand it might be argued that inclusion of pure EHR operations is justifiable in that it should encourage the use of CO₂ as injection fluid rather than other substances.

²⁹ This effectively means that any injection after the completion of recovery operations will count as storage for the purposes of the Directive. The only very narrow exception might be where CO₂ separated from the final quantum of oil is re-injected.

Art 12 requirements do not apply to such streams. A more relevant question is the application of Art 12 where there is incremental storage during or after EHR operations (i.e. the site does qualify as a CCS storage site under the Directive) and where the CO₂ that is injected for final storage has already been mingled with other substances following its use during EHR operations. Our understanding is that during EHR operations, CO₂ is separated from produced fluids (oil, gas, CO₂ and brine) as a gaseous phase and then re-injected (recycled) to promote further oil recovery. The re-injected stream would not include oil or water, except in very small amounts of vapour mixed with the CO₂, but the more problematic issue may be gas. In some cases, however, water and/or hydrocarbons may be removed from the gaseous phase before re-injection, so that it is nearly pure CO₂.

Nevertheless, one needs to ask how Art 12 should be read in that light. The primary requirement is that the CO₂ stream shall consist '*overwhelmingly*' of CO₂, and that "*no waste or other matter may be added for the purpose of disposing of that waste or other matter*". The fact that CO₂ during a recovery operation becomes intermingled, notably with gas, does not, in our view, offend the prohibition in Art 12 against adding waste or other matter. This is clearly aimed at the mischief of using the CO₂ disposal route as a surrogate for getting rid of other wastes and matters, while here one would be returning a substance already in the ground at that location. The motivation for re-injecting the CO₂ could hardly be described as "*for the purpose of disposal of*" such matter.

Art 12 then allows the stream to contain "*incidental associated substances from the source, capture or injection process*" provided these are below levels that would affect the integrity of the site, pose a significant risk to the environment or human health, or breach EC legislation. The question here is whether this provision can accommodate the additional co-mingling of CO₂ with gas. Our view is this is not a wholly convincing argument. The 'injection' process in Art 12 clearly refers to injection that falls within the scope of the Directive, and it has already been argued that pure EHR operations are not included within the Directive. The co-mingling of the CO₂ with gas is a result of an injection operation not falling within the scope of the Directive, and it would be an odd result if EHR operators could take advantage of this provision not available to those injecting CO₂ which had not been preceded by EHR. Against this view, it might be argued that with an operation involving concurrent EHR and storage, the storage operation could not economically proceed without the oil production and gas recycling, and therefore the recycling of produced gas (CO₂ + "incidental" natural gas) is in effect an inherent part of the storage operation. Therefore, this injection is part of the CCS injection process and the gas would be considered permissible under Art 12 as a substance incidentally associated with the CCS injection.

A more convincing argument, however, is that the mischief that the acceptance stream criteria provisions are aimed at is to ensure that the addition of substances from *external* sources is maintained to a specified quality. In the case of EHR operations, aside from the CO₂, no additional substances are being injected – all the methane, oil, brine and so on were already present, and are just being returned, though in a different form of co-mingling. This would mean that a storage site could still comply with the terms of the Directive provided the CO₂ contains no external addition of substances beyond those permitted by the Directive. Given the clear wording of the Directive, this would be a fairly bold interpretation and one that might eventually have to be resolved by the courts. In such an exercise, a court is likely to want to consider the extent to which the environmental integrity of the site is in any way changed or jeopardised by the injection of what becomes co-mingled CO₂, as opposed to '*overwhelmingly*' CO₂. Given the origin and quantity of the materials, it seems extremely unlikely that the integrity would be affected.

Another interpretation which supports this approach is to note that the Art 12 requirement refers to the 'CO₂ stream'. Art 3.13 defines a CO₂ stream as meaning '*a flow of substances that results from CO₂ capture processes*'. On this reading, any gas that derives from the EHR operations rather than the capture process is legally not part of the CO₂ stream as such, but part of the EHR operation. The 'stream' means only the CO₂ material that is delivered to the site, and provided this stream meets the '*overwhelmingly*' requirement, the primary obligation under Art 12 is satisfied. It might be argued that this interpretation potentially allows too much of a loophole in that it would permit any substances to be added after the capture process and is an overly narrow construction which is not consistent with the general provisions of Art 12 which expressly refers to substances added during operations (*a CO₂ stream may contain incidental associated substances from the source, capture or injection process and trace substances added to assist in monitoring and verifying CO₂ migration*).

Finally, if the above arguments are not accepted one should note that the ‘overwhelmingly’ standard clearly still has some built-in flexibility which could go some way to accommodating the additional comingling of CO₂ with gas or other substances within the strata following recovery operations. The primary legal obligation is on Member States to ensure that CO₂ streams are in line with the Art 12 conditions, and Art 12.2 allows the Commission to adopt guidelines to help identify the conditions applicable on a case-by-case basis for respecting the criteria in Art 12.1. The current Guidelines do not deal with the question of combined EHR operations, and, if such operations are to be encouraged, it would be sensible to encourage the development of guidelines dealing specifically with that situation. It would, for example, be consistent with the Directive to require that pure CCS has CO₂ streams of 95% purity while those streams following EHR may have, say, 80% CO₂ purity provided any additional substances have been sourced from the site itself. But any guidance approaching 50% would offend the overall notion of ‘overwhelmingly’.

To assume that Guidance itself will deal with the issue is probably unwise. Our understanding is that generally, at the beginning of CO₂ injection, all of the produced gas is hydrocarbons, then after a period (typically 0.5 to 3 years) some injected CO₂ reaches production wells. Although the proportion of CO₂ in the gas rises fairly quickly, it will be mixed in the separation process with fluids from wells which CO₂ has not yet reached, so that the aggregate fraction of CO₂ is small. Typically, the total fluid rises to about 85% over a couple years, but it is locally variable. If the aggregate output of the recycling process is considered, then there is likely to be a period of several years where the recycle stream is not overwhelmingly CO₂.

The analysis demonstrates that there are a considerable number of challenges in applying the current stream acceptance provisions of the Directive to combined EHR operations. It seems likely that, at the time when the Directive was developed, the detailed implications for combined EHR operations were not fully appreciated – nor indeed the potential significance of EHR combined operations in attracting investment for CCS. Amending Art 12 of the Directive to reflect the distinctive characteristics of such combined operations is recommended.

The UK implementing regulations³⁰ essentially repeat the wording of the Directive by requiring that any storage permit contain provisions on acceptance and injection that provide that:

(1) In order to be injected into the storage site the CO₂ stream must consist overwhelmingly of carbon dioxide, and must in particular satisfy the conditions in sub-paragraph (2).

(2) The stream—

(a) must contain no waste or other matter added for the purposes of disposal;

(b) may contain incidental or trace substances (to the extent permitted by any legislation applicable to those substances), but only if the concentrations of all such substances are below the levels that would—

(i) adversely affect the integrity of the storage site or the relevant transport infrastructure,
or

(ii) pose a significant risk to the environment or human health.

(3) In sub-paragraph (2)—

(a) “incidental substance” means a substance which has become associated with the CO₂ either at its original source or as a result of the process of capture or injection;

6. Emission Trading Regime and EHR Operations

6.1 Application of the ETS systems to Carbon Capture and Storage

The EU Emissions Trading regime, originally launched under Directive 2003/87/EC is a cap-and-trade system whereby a decreasing cap on specified GHG gases is imposed and allowances are issued (Phase I-II EU ETS) or auctioned (Phase III EU ETS) to installations covered by the scheme. Under the

³⁰ Schedule 2 Storage of Carbon Dioxide (Licencing etc.) Regulations 2010 SI 2010/2221.

scheme one allowance grants the right to emit one tonne of CO₂ equivalent within a given trading period (Art 3). Installations carrying out activities covered by the scheme must obtain an ETS permit and acquire allowances to offset their emissions. At the end of each trading period, they are required to surrender to the competent authority a number of allowances equivalent to their verified emissions for cancellation.

EC Directive 2009/29/EC amended the 2003 Directive by, *inter alia*, expanding its scope to also cover installations undertaking the following activities (from 2013 onwards – ETS Phase III):

- Capture of greenhouse gases from installations covered by this Directive for the purpose of transport and geological storage in a storage site permitted under Directive 2009/31/EC.
- Transport of greenhouse gases by pipelines for geological storage in a storage site permitted under Directive 2009/31/EC.
- Geological storage of greenhouse gases in a storage site permitted under Directive 2009/31/EC.

This means that installations carrying out pure CO₂ storage activities (encompassing capture, transport by pipeline and permanent storage) must acquire an ETS permit and, therefore, monitor and report their emissions pursuant to the ETS Directive. The 2012 Monitoring Regulation provides further requirements for this, and further guidance is provided by the Guidance on Interpretation of Annex I of the EU ETS Directive. On the assumption that EHR activities (including any inevitable storage solely attributable to EHR) fall outside the scope of the CCS Directive, it follows that such sites also fall outside the scope of the ETS Directive as amended and that there is no requirement to either obtain an ETS permit, acquire or surrender allowances, or monitor and report GHG emissions. Similarly, operators of installations where CO₂ is transferred for pure EHR operations are not entitled to take advantage of the provisions allowing subtraction of the emissions.

Article 10a (3) of the 2003 Directive as amended provides that CCS installations (i.e. “installations for the capture of CO₂, to pipelines for transport of CO₂ or to CO₂ storage sites”) will not be granted free allocation of allowances in Phase III of the ETS.³¹ As a result, CCS installations are not required to surrender allowances ‘in respect of emissions verified as captured and transported for permanent storage to a facility for which a permit is in force’ in accordance with the CCS Directive (Art. 12. 3(a)). Rules for monitoring and reporting of emissions, and their consequent subtraction, are provided by Regulation 2012 Art 49(1) and Annex IV. In effect it will be the operator of the capture plant that secures the main financial benefit from not having to surrender allowances in relation to captured CO₂ which is transported to a storage site in accordance with the CCS Directive.

Where CO₂ is sent to an EHR site with a view to its eventual disposal in quantities that are not required by the EHR process itself (described as incremental storage in the categorisation in section 2 above), then such a site needs to comply with the CCS Directive, and is eligible for inclusion with the ETS scheme, along with associated capture and transport facilities.

6.2 Transport of CO₂ by ship

Our understanding is that for both practical and commercial reasons, operators of offshore EHR sites may find it attractive to transport CO₂ by ship rather than pipeline. The legal question here is whether, assuming the operator wishes the site to fall within the ETS scheme, this form of transport will jeopardise the financial advantages of any such inclusion.

A recent study³² concludes that, where CO₂ is transported by ship, the shipment chain envisaged by the ETS scheme is broken between any associated capture plant and eventual storage site, with the result that the operators of the facilities will still have to surrender allowances and cannot take advantage of the provisions in the ETS Directive allowing the allowances to be retained. The legal provisions, though,

³¹ Subject to the ETS provisions on cases of free allocation for district heating and high efficiency cogeneration the specific case of the NER300 scheme (article 10a (4) and (8)) and the option for transitional free allocation for the modernisation of electricity generation (article 10c).

³² Bech-Bruun EOR/CCS 360 Degree Legal Review (Bech Bruun 2012).

are not entirely clear and counter-arguments could be raised.

Commission Regulation 601/2012 provides the core legal requirements concerning the monitoring and reporting of greenhouse gas emissions for the emissions trading period beginning January 1 2013 and subsequent periods. Art 49 provides the critical financial incentive for CCS operations:

1. The operator shall subtract from the emissions of the installation any amount of CO₂ originating from fossil carbon in activities covered by Annex I to Directive 2003/87/EC, which is not emitted from the installation, but transferred out of the installation to any of the following:

(a) a capture installation for the purpose of transport and long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(b) a transport network with the purpose of long-term geological storage in a storage site permitted under Directive 2009/31/EC;

(c) a storage site permitted under Directive 2009/31/EC for the purpose of long-term geological storage.

For any other transfer of CO₂ out of the installation, no subtraction of CO₂ from the installation's emissions shall be allowed.

The CCS Directive defines a transport network as “*the network of pipelines, including associated booster stations, for the transport of CO₂ to the storage site*”. This clearly does not include ships. Looking at Art 49 in isolation, it could be argued that it allows subtraction where CO₂ is transferred to ‘any’ of the specified installations without prescribing the means of transfer to that installation. On that interpretation an operator of a capture plant using a ship could be said to be transferring CO₂ to the storage site and thus fall within Art 49.

However, looking at the scheme as a whole, it makes more sense to read these provisions as meaning that, to acquire the rights to subtract under Art 49, any transfer has to be in an unbroken chain from the capture plant, via a transport network as defined and to the storage site. It would make little sense if subtraction could be obtained by simply a transfer to a capture plant or pipelines without any eventual storage (an interpretation that would follow if one reads ‘any’ to mean each of these routes as distinctive and individual destinations). It also gives meaning to the prohibition on subtraction in the final the sentence – ‘*for any other transfer*’. In effect, when a ship is being used, the transfer from the capture plant is a transfer to a ship albeit the final destination is a storage site.

Support for this interpretation is found in Recital 13 of the Preamble of the Regulation stating that:

To close potential loopholes connected to the transfer of [...] pure CO₂, such transfers should only be allowed subject to very specific conditions. Those conditions are that [...] the transfer of pure CO₂ should only occur for the purposes of storage in a geological storage site pursuant to the Union's greenhouse gas emission allowance trading scheme, which is at the present the only form of permanent storage of CO₂ accepted under the Union's greenhouse gas emission trading scheme.

Furthermore, the Guidance Document on the Monitoring and Reporting Regulation,³³ which states that “*Under the new rules, CO₂ being not emitted, but transferred out of an installation, may be subtracted from that installation's emissions **only** if the receiving installation is one of [those included in Regulation's article 49 (1)]*”.³⁴ Discussing the methodology for subtracting the emissions, the guidance refers to “*receiving installation*”. The definition of installation under the ETS Directive is “*a stationary technical unit where one or more activities listed in Annex I are carried out and any other directly associated activities which have a technical connection with the activities carried out on that site and which could have an*

³³ MRR Guidance Document No. 1, Version of 16 July 2012

³⁴ Para 8.3.1.

effect on emissions and pollution.³⁵ As a result, it seems unlikely that ships, which are by definition non-stationary, can be considered as legitimate “receiving installations” under the Regulation.

Recital 13 of the Preamble of Regulation concludes that these specific conditions under which transfer of CO₂ is allowed, “*should not, nevertheless, exclude the possibility of future innovations*”. This proviso would support the argument that CO₂ transport by ship could be included in the scheme at a later stage, should technological innovation ensure that the integrity of the system can still be ensured using other means of transport.

Unless and until the legislation is amended, in the meantime it may be possible for Member States to invoke the provision in Article 24 of the Emissions Trading Directive 2003, which provides that:

1. From 2008, Member States may apply emission allowance trading in accordance with this Directive to activities and to greenhouse gases which are not listed in Annex I, taking into account all relevant criteria, in particular the effects on the internal market, potential distortions of competition, the environmental integrity of the Community scheme and the reliability of the planned monitoring and reporting system, provided that inclusion of such activities and greenhouse gases is approved by the Commission (a) in accordance with the regulatory procedure referred to in Article 23(2), if the inclusion refers to installations which are not covered by Annex I; or (b) in accordance with the regulatory procedure with scrutiny referred to in Article 23(3), if the inclusion refers to activities and greenhouse gases which are not listed in Annex I. Those measures are designed to amend non-essential elements of this Directive by supplementing it.

2. When the inclusion of additional activities and gases is approved, the Commission may at the same time authorise the issue of additional allowances and may authorise other Member States to include such additional activities and gases.

3. On the initiative of the Commission or at the request of a Member State, a regulation may be adopted on the monitoring of, and reporting on, emissions concerning activities, installations and greenhouse gases which are not listed as a combination in Annex I, if that monitoring and reporting can be carried out with sufficient accuracy. That measure, designed to amend non-essential elements of this Directive by supplementing it, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 23(3).

This is the route advocated in the 2012 Bech-Bruun Report,³⁶ and we understand that for one of the NER projects where transport by ship was proposed, the Commission was considering using Art 24, though in the event the project was not pursued. It is worth noting, though, that an ‘installation’ referred to in Article 24 is defined as a stationary technical unit “*and any other directly associated activities which have a technical connection with the activities carried out on that site*”. As already indicated above, it seems a strained reading to include a ship used for transport as part of the ‘installation’ under this definition, but the Directive is not confined to stationary installations and Article 2 of the Directive applies to “Activities” listed in Annex I. “Activity” is not defined as such but appears to be sufficiently broad to encompass a ship transporting CO₂, and thus its inclusion as an additional ‘activity’ under Art 24.1 is permissible.

Dealing with the issue case by case, however, does not appear to be a satisfactory long-term solution to provide a stable legal framework to encourage combined EHR operations. It is unclear whether the exclusion of transport by shipping from the Directive 601/2012 was a legislative oversight or an express doubt about the accounting methodologies for transport by ship as opposed to transport by network. The

³⁵ It could be argued a ship used for transport would be considered a ‘directly associated activity’ under the terms of the provision. Also useful in this context is the definition of “emissions” under the ETS Directive which is “the release of greenhouse gases into the atmosphere from sources in an *installation* or the release from an aircraft performing an aviation activity listed in Annex I of the gases specified in respect of that activity”. So if emissions are emitted, or re-emitted, from a non-stationary sources, such a ship, they will not be accountable under the Scheme.

³⁶ Bech-Bruun EOR/CCS 360 Degree Legal Review (Bech Bruun 2012).

problem stems from the CCS Directive's definition of a transport network and we would recommend this is an issue that should be considered in any proposed revision of the Directive.

7. Waste and the legal status of CO₂ used for EHR purposes.

7.1 Exclusion of captured CO₂ for geological storage from EU waste law

The CCS Directive amended Art 2(1)(a) of the EC Framework Directive on Waste 2006/12/EC by adding to its list of exclusions from the EC definition of waste:

gaseous effluents emitted into the atmosphere and carbon dioxide captured and transported for the purposes of geological storage and geologically stored in accordance with Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide or excluded from the scope of that Directive pursuant to its Article 2(2).

The intention was that the CCS Directive would provide the core regulatory framework for CCS storage and the application of EU waste legislation would be duplicative. From 12 December 2010 this 2006 Waste Framework Directive was repealed and replaced by the new Waste Framework Directive 2008/98/EC. Article 2 of the 2008 Directive repeats the list of exclusions but has not carried forward the specific reference to captured carbon dioxide. We suspect that this was a legislative oversight and the European Commission has referred us to Article 41 of the 2008 Directive which provides that "References to the repealed Directives shall be construed as references to this Directive and shall be read in accordance with the correlation table set out in Annex V" arguing that this is sufficient to carry forward the CCS exclusion into the 2008 Directive. This is hardly satisfactory for legal clarity, and it would be preferable if Article 2 of the 2008 Directive were amended to make the CCS exclusion clear.

Our understanding is that in the foreseeable future any CO₂ used for UK EHR operations will be at sites fulfilling the CCS Directive's requirements, meaning that CO₂ acquired from capture plants can take advantage of the emissions trading regime provisions. Such CO₂ should fall within the waste exclusion since in a combined operation one of the purposes of capture and transporting will be for long-term storage, even though it is used for EHR operations in the intermediate period. Nevertheless, there is potential ambiguity here, and it would be preferable to secure a more clearly worded exclusion to incorporate CO₂ captured and transported for a combined operation.

But captured CO₂ used for *pure* EHR operations cannot take advantage of this exclusion and, furthermore, it does not fall within the exclusion of gaseous effluents since by definition they have not been emitted into the atmosphere. There are clearly significant, though not insuperable, legal consequences were such CO₂ to be considered waste in law. Any transfer of CO₂ would have to satisfy waste transfer requirements, and any storage site would presumably be considered a waste management site. It does not follow, however, that the CO₂ is necessarily waste under EU law and the 2008 Waste Framework Directive has built upon, and in some respects codified, the developing and complex case law of the Court of Justice of the European Union, determining when a substance is really a by-product rather than a waste and when a waste ceases to be a waste in law.

7.2 Is captured CO₂ a by-Product?

Art 5 of the 2008 Directive provides that by-products are not to be regarded as waste and provides conditions for the meaning of a by-product, reflecting the jurisprudence of the European Court:

5(1) A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste referred to in point (1) of Article 3 but as being a by-product only if the following conditions are met:

- (a) further use of the substance or object is certain;
- (b) the substance or object can be used directly without any further processing other than normal industrial practice;
- (c) the substance or object is produced as an integral part of a production process; and
- (d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

The issue here is whether a power station, say, with a capture plant, can argue that the captured CO₂ is a by-product within the meaning of 5.1 where the captured CO₂ is to be used as part of an EHR operation. The European Commission has produced Guidelines³⁷ on the interpretation of these and other provisions in the Directive and, although these are non-legally binding, they provide a valuable explanation of some of the key concepts.

The 'certainty' requirement can be satisfied where there is a contract between the producer and the EHR operator.³⁸ But there will be doubts whether the processes involved in the capture process, including purification, would meet the test of using the substance '*without any further processing other than normal industrial practice.*' As the Guidance note indicates:

...treatment techniques that address typical waste-related characteristics of the production residue, such as its contamination with components which are hazardous or not useful, would prevent classification as non-waste. This is to ensure that such operations, which might pose risks to the environment or human health, are monitored under waste management law in accordance with the precautionary principle. On the other hand, a treatment which is normal industrial practice, e.g. modification of size or shape by mechanical treatment does not prevent the production residue from being regarded as a by-product.³⁹

The concept of a by-product is normally associated with a production process for, say, steel products where off-cuts or similar residues are then commercially exploited. One could imagine, for example, a factory using CO₂ for carbonated products where excess CO₂ is then sold to an EHR operator - here the by-product concept would be readily applicable. It would be far more challenging to apply the concept to what are in effect waste emissions from a power-station which are transformed by a capture plant into liquified CO₂ suitable for use in the EHR process. We understand that this generally consists of removing water and any other contaminants such as hydrogen sulphide in order to control corrosion of pipes and equipment, and then compressing it (for efficiency of transportation). Even though this may be familiar practice, that does not mean that it is 'normal industrial practice' within the meaning of Art 5(1) and, if anything, the processes fall more naturally within the concept of waste treatment techniques described in the Guidance. But once processed, it may well be considered to have ceased being waste under the new 'end of waste' provisions in the Directive considered in the next section.

7.3 End of waste

The 2008 Framework Directive has also made it clearer when waste ceases to be a waste in law, again building upon and reflecting complex case law of the Court of Justice of the European Union. Art 6 of the Directive provides that:

³⁷ European Commission *Guidelines on the interpretation of key provisions of Directive 2008/98/EC on waste* (European Commission 2012).

³⁸ Other indicators of certainty can include a financial advantage for the producer or a "*solid market (sound supply and demand) existing for this further use*" (Commission Guidelines supra 1.2.3).

³⁹ Ibid 1.2.4.

1. Certain specified waste shall cease to be waste within the meaning of point (1) of Article 3 when it has undergone a recovery, including recycling, operation and complies with specific criteria to be developed in accordance with the following conditions:

(a) the substance or object is commonly used for specific purposes;

(b) a market or demand exists for such a substance or object;

(c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and

(d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.

The criteria shall include limit values for pollutants where necessary and shall take into account any possible adverse environmental effects of the substance or object.

CO₂ once emitted into the atmosphere is not a waste under the Directive, but prior to that it appears to fall within the general definition of 'waste' under the Directive as being a "substance or object which the holder discards or intends or is required to discard" (Art 3). The end of waste provisions apply to objects or substances subject to a "recovery" operation defined in very broad terms in Art 3 as "any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy".⁴⁰ A capture plant would clearly fall within such a concept.

End of waste criteria can be developed at Community level under Art 6. Under these provisions, end of waste criteria have been produced for iron, steel and aluminium scrap⁴¹ and more recently glass cullet.⁴²

There is no indication that in the foreseeable future capture CO₂ will be selected as a candidate for the development of Community end of waste criteria.⁴³ Where there are no such criteria, Art 6.4 provides that "Member States may decide case by case whether certain waste has ceased to be waste taking into account the applicable case law."⁴⁴

Applying the principles of existing case law and taking account of the need to look at the specific technical issues involved, it seems likely that CO₂ captured and transformed into liquefied CO₂ of a suitable quality to be used in pure EHR operations would be considered as ceasing to be waste at that point, providing there was a market for the substance. In effect, it can be seen as a substitute for a raw product (natural CO₂). The key contemporary decision of the British courts dealing with the issue is *R (OSS) Group Ltd v Environment Agency and Others*,⁴⁵ dealing with the question of whether waste lubricating oil converted into a marketable fuel oil had ceased to be waste. In the leading judgment Lord Justice Carnwath provided a robust analysis of the complex case law of the Court of Justice of the European Union: "As this review demonstrates, a search for logical coherence in the Luxembourg case-law is probably doomed to failure".⁴⁶ He concluded on the facts that once the waste oil had been converted into a product for use as fuel, it had ceased to be waste: "It should be enough that the holder has converted the waste material into a distinct, marketable product, which can be used in exactly the same way as an ordinary fuel, and with no worse environmental effects."⁴⁷ Applying the same approach, it is likely that captured CO₂, which has been processed for use by an EHR operator and contains no significant contaminants

⁴⁰ Annex II of the Directive lists a non-exhaustive list of recovery operations.

⁴¹ Council Regulation No 333/2011 of 31 March 2011.

⁴² Commission regulation (EU) 1179/2012 of 10 December 2012 establishing criteria determining when glass cullet ceases to be waste

⁴³ See European Commission Joint Research Centre *Study on the selection of waste streams for end-of-waste assessment*. Final Report 24362 EN (August 2010).

⁴⁴ Art 6.4 requires the Member State to notify the Commission of any such decision in accordance with Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.

⁴⁵ Court of Appeal [2007] EWCA Civ 611.

⁴⁶ *R (OSS) Group Ltd v Environment Agency and Others*, para [55].

⁴⁷ *Ibid*, para [63].

or other environmentally damaging properties, would no longer be waste in law.

8. UK Implementation of the EU CCS Directive

8.1 Energy Act 2008 and Regulations

Part III of the Act provides a framework for regulating CO₂ storage (and various associated activities) in the UK territorial sea and Gas Importation and Storage Zone. Such activities may only be undertaken in accordance with a licence granted by the Secretary of State for Energy and Climate Change.⁴⁸ The Act was passed in anticipation of the EU Directive being agreed (though the broad outlines were understood at the time) and, under general EU principles, it is perfectly acceptable for existing legislation to be used to implement an EU Directive.

The Directive applies to the “geological storage of CO₂” defined as “*injection accompanied by storage of CO₂ streams in underground geological formations*” (Art 3(1)). As discussed above, the wording could in theory cover unrecovered CO₂ injected during EHR operations, but given the whole context of the legislation this is a fairly strained reading. The Energy Act, however, is rather clearer in that it prohibits without a licence CO₂ storage “*with a view to its permanent disposal, or as an interim measure prior to its permanent disposal*” (s 17(2)). This appears to clearly exclude CO₂ injected during EHR operations, and appears to be consistent with a sensible reading of the Directive where Art 1 refers to the purpose of environmentally safe geological storage of CO₂ being the ‘permanent containment’ of CO₂. The second part of the prohibition (interim measures) would include a buffering zone provided this was connected with the final disposal operations rather than EHR.

At the time of the passing of the Energy Act 2008, the final details of the CCS Directive were not yet known, and the Act provides for the making of regulations to flesh out the detail of licensing requirements and conditions. Regulations⁴⁹ made under the Energy Act 2008 (and the European Communities Act 1972) implement provisions of the EU CCS Directive, concerning conditions for granting licences and exploration permits, the obligations of the relevant storage operator, the closure of the CO₂ storage site, the post-closure period and financial security.

S 33 of the Energy Act 2008 allows CCS controls to be applied to Enhanced Oil Recovery by means of an order by providing that:

Enhanced petroleum recovery: power to make orders

(1) The use of carbon dioxide, in a controlled place, for a purpose ancillary to getting petroleum is to be regarded as—

(a) an activity within section 17(2), or

(b) the storage of gas for the purposes of section 1(3)(b),

only in the circumstances specified by the Secretary of State by order.

S 33(3) goes on to provide that that the Secretary of State may extend the order to EOR activities carried out in the area of the Continental Shelf where the area in question falls outside any area designated as a Gas Importation and Storage Zone. No such order has been made to date. According to the

⁴⁸ Scottish Ministers if proposed activities are located in the territorial sea adjacent to Scotland.

⁴⁹ The Storage of Carbon Dioxide (Licensing etc.) Regulations 2010; The Storage of Carbon Dioxide (Termination of Licences) Regulations 2011; The Storage of Carbon Dioxide (Licensing etc.) (Scotland) Regulations 2011; The Storage of Carbon Dioxide (Amendment of the Energy Act 2008 etc.) Regulations 2011; The Storage of Carbon Dioxide (Access to Infrastructure) Regulations 2011; The Environmental Liability (Scotland) Amendment Regulations 2011; The Energy Act 2008 (Storage of Carbon Dioxide) (Scotland) Regulations 2011; The Storage of Carbon Dioxide (Inspections etc.) Regulations 2012.

Explanatory Notes, which accompany the legislation when promoted through Parliament (and are used by the courts to assist in interpretation), “*The intention is to use this power, for example, to ensure that the requirements of this Chapter extend to operators undertaking an EOR activity if those operators wish to claim credits under the EU Emissions Trading Scheme (once carbon dioxide storage projects are included in that scheme)*”. As discussed in the EU section, only storage sites falling within the Directive are eligible for ETS registration, and the policy in the Explanatory Memorandum provides a reflection of this. But the Directive is not conditional on an operator claiming credits, but applies to the geological storage of CO₂ whether credits sought or not. The Explanatory Memorandum clearly states that this is one example, and was written at a time when the Directive and the amendments to the ETS scheme to cover CCS schemes were not fully realised. The fact that an operator wishes to gain credits should not be taken as the sole trigger mechanism for the application of the Directive.

8.2 Petroleum Act 1998 Licences

Pure EHR operations will fall within the scope of the Petroleum Act 1998 which allows the Secretary of State to issue licences (Seaward Production Licences) in order to “*search, bore for and get*” petroleum. Regulations and Model Clauses that have been issued do not contain detailed provisions concerning CCS storage and EOR operations. The Department of Energy and Climate Change (DECC) has not established clear guidance regarding the extent to which Seaward Production Licensees can also undertake exploration and appraisal for CO₂ storage. In practical terms, there is no clear distinction between non-intrusive exploration for the purposes of petroleum development (including EOR), or non-EOR CO₂ storage - seismic surveys for example, will provide information relevant to both activities.

8.3 Consistency between licensing regimes

If DECC issues orders reversing the default regulatory position for EOR projects, such projects will be concurrently regulated in accordance with the terms of both a Seaward Production Licence and a CO₂ Storage Licence (including, where applicable, a CO₂ Storage Permit). Alternatively, the process might take place sequentially - an operation could begin as pure EHR and later convert into a CCS storage operation requiring an Energy Act licence. It is therefore important that both licensing frameworks are harmonised.

There are no obvious inconsistencies between the requirements imposed by the Seaward Production Licence and the CO₂ Storage Licence (and Permit). Rather, the CO₂ Storage Licence imposes additional conditions (e.g. concerning financial security, on-going monitoring) to those contained in the relevant Seaward Production Licence.

Clear attempts to integrate both licensing frameworks are evident. For example, the mandatory Work Programme component of a CO₂ Storage Licence must consist of either:

- an intrusive and non-intrusive exploration / appraisal activity in addition to submission of a CO₂ Storage Permit,⁵⁰ to be completed during an ‘Appraisal Term’; or
- submission of a CO₂ Storage Permit application during an ‘Initial Term’ without significant appraisal activity.

The provision for an ‘Initial Term’ accommodates the needs of prospective EHR operators by streamlining the CO₂ storage licensing process in cases where the requisite appraisal activity has already been undertaken under a Seaward Production Licence (either by the prospective enhanced recovery operator, or another petroleum developer that has transferred the site to the prospective operator).

In practice, the Petroleum Act 1998 and Energy Act 2008 licensing frameworks are unlikely to be applied in an un-coordinated manner because both frameworks are administered by a single organisational unit within DECC – the Energy Development Unit. Note, however, that the Scottish Ministers issue CO₂ Storage Licences within the territorial sea adjacent to Scotland.⁵¹ DECC (and Marine Scotland in relation

⁵⁰ The permit will expire if this application is not submitted.

⁵¹ In the event that the activity or the area straddles the boundary of the Scottish territorial sea, either DECC or the Scottish Ministers may issue the licence. In the case of subsequent construction of installations under the licence,

to the relevant CO₂ Storage Licences) also retain significant discretion to adapt and modify the conditions of concurrent licences in the event an inconsistency or conflicting requirement becomes apparent.

8.4 Marine and Coastal Access Act 2009⁵²

Part 4 of the MCAA establishes a marine licensing system which applies to a broad range of marine activities.⁵³ Different components of the system are administered by the Marine Management Organisation and relevant government bodies in Northern Ireland, Scotland and Wales.⁵⁴ For certain offshore “nationally significant infrastructure projects” (NSIPs), defined under the Planning Act 2008 (i.e. large harbour facilities and electricity generating stations with a capacity >100MW), the marine licence is issued automatically (‘deemed’) as part of a “development consent order” issued by the relevant Secretary of State.⁵⁵ The Secretary of State issues such orders after receiving advice from the Major Infrastructure Planning Unit (within the Planning Inspectorate), which undertakes planning for NSIPs.⁵⁶

However, the provisions of the Act concerning licences do not apply to EHR or CCS. S 77 provides that:

Nothing in this Part applies to any of the following—

(a) anything done in the course of carrying on an activity for which a licence under section 3 of the Petroleum Act 1998 (c. 17) or section 2 of the Petroleum (Production) Act 1934 (c. 36) (licences to search for and get petroleum) is required;

(b) anything done for the purpose of constructing or maintaining a pipeline as respects any part of which an authorisation (within the meaning of Part 3 of the Petroleum Act 1998) is in force;

(c) anything done for the purpose of establishing or maintaining an offshore installation (within the meaning of Part 4 of the Petroleum Act 1998 (c. 17));

(d) anything done in the course of carrying on an activity for which a licence under section 4 or 18 of the Energy Act 2008 (c. 32) is required (gas unloading, storage and recovery, and carbon dioxide storage).

8.5 Crown Estate Act 1961

The Crown Estate Act 1961 sets out the powers and duties of the Commissioners, prescribing in general terms the manner in which they are to manage the Estate,⁵⁷ which includes: almost all of the seabed within the UK territorial sea limit, in addition to the UK’s sovereign rights over the continental shelf (except in relation to oil, gas and coal), Renewable Energy Zone, and Gas Importation and Storage Zone.⁵⁸ Consequently, in addition to satisfying applicable regulatory requirements, offshore EHR activities and CO₂ storage impacting on the Estate (i.e., to the extent that such activities are licensable under the Energy Act 2008) must also be authorised by a contractual agreement (lease or agreement-for-lease) between the relevant developer and the Commissioners. These agreements provide a flexible legal basis for the Commissioners to manage and control relevant offshore activities. The basic duty of the Commissioners in relation to the Estate is to “maintain and enhance its value and the return obtained

the competent authority is whichever authority ‘licences the activities for the purposes of which the installation is established or maintained.’: Energy Act 2008 section 18(2).

⁵² For a detailed overview of the Act’s provisions, see Marine and Coastal Access Act 2009: Explanatory Notes, available at <<http://www.legislation.gov.uk/>>.

⁵³ MCAA Part 4. The many and various licensable activities are set out in section 66.

⁵⁴ See MCAA Section 113.

⁵⁵ See Planning Act 2008 sections 14–21, MCAA Schedule 8 paragraph 4.

⁵⁶ See Planning Act 2008, as amended by the Localism Act 2011.

⁵⁷ See in particular Crown Estate Act 1961 section 3.

⁵⁸ See Crown Estate. Schedule of The Crown Estate’s properties rights and interests. July 2012. Available at <<http://www.thecrownestate.co.uk/>>. See also Continental Shelf Act 1964 section 1; Energy Act 2004 Part 2 Chapter 2; Energy Act 2008 Part 1 Chapter 1.

from it, but with due regard to the requirements of good management.”⁵⁹

9. Transportation of CO₂

9.1 Pipeline transport

The Offshore Installations (Safety Case) Regulations 1992 (OSCR), the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER), Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 (MAR), and Pipelines Safety Regulations 1996, establish a network of interrelated duties to address the installation/pipeline interface. Pipeline operators are among those required by Regulation 8 of MAR to co-operate with installation duty holders to enable the latter to comply with health and safety law, including OSCR. For example, Schedule 2 requires details of pipelines with the potential to cause a major accident, plus descriptions of arrangements to comply with provisions of PSR, including a summary of the Major Accident Prevention Document.

In 2009, the HSE Board agreed to a formal consultation on the proposals to amend the Pipelines Safety Regulations 1996 (PSR) (HSE/09/103), to include both gas and CO₂ as named “dangerous fluids”. This would trigger the requirements in Part II of the regulations concerning Major Accident Hazard Pipelines.⁶⁰ Following consultation, it was decided to postpone the amendments to allow for further consideration of the concerns raised. Further to these discussions, in January 2012 HSE recommended (with regard to CCS) that the “current position” be maintained and that scientific and technical developments be kept under review so as to “ensure the most appropriate regulatory model is developed”.⁶¹ The main motivation appeared to be the need to avoid unnecessary new regulation in the light of the Coalition Government’s general policy on regulation. Pending this review of scientific and technical developments, the “current position” requires that developers of proposals under the UK CCS Demonstration Project⁶² are required to give a health and safety demonstration *as if* CO₂ were classified as a “dangerous fluid” under PSR and (for offshore installations) as if all applicable offshore regulations applied so as to comply with the Health and Safety at Work Act 1974.

Although the proposals for the amendments to the pipeline regulations were discussed in the context of carbon capture and storage, there is no logical reason why the transport of CO₂ by pipeline for EHR purposes should be treated any differently. EHR is not discussed expressly in the HSE discussion document, but the draft amendments to the Regulations attached to the Consultation document simply propose to include “carbon dioxide”, without specifying its intended use. It would therefore have to apply to transport of CO₂ for pure EHR purposes.

9.2 Pipeline design

HSE current guidance⁶³ notes that existing standards for pipeline design and safety (e.g. IP6, BS EN 14161, BS PD 8010 and DNV OS-F101) do not address the transport of CO₂, its dense or supercritical phases specifically. Moreover, the codes were not drafted with the bulk transportation of CO₂ in mind (as is likely to be seen in CCS projects). The current HSE advice is that, for CCS purposes, the industry should treat CO₂ pipelines as though they are conveying natural gas (for which standards exist).⁶⁴

⁵⁹ Crown Estate Act 1961 section 1(3).

⁶⁰ e.g. installation of emergency shut-down valves, preparation of Major Accident Review Document, preparation of Emergency Plans by local authorities with the cost of plan preparation imposed on pipeline operator.

⁶¹ HSE Board Meeting January 2012

<http://www.hse.gov.uk/aboutus/meetings/hseboard/2012/250112/pjanb1210.pdf> accessed March 25 2013.

⁶² CCS Project Information Memorandum:

<[http://www.decc.gov.uk/media/viewfile.ashx?filepath=what we do/uk energy supply/energy mix/carbon capture and storage/demo_comp/file42478.pdf&filetype=4](http://www.decc.gov.uk/media/viewfile.ashx?filepath=what%20we%20do/uk%20energy%20supply/energy%20mix/carbon%20capture%20and%20storage/demo_comp/file42478.pdf&filetype=4)> accessed April 10 2013.

⁶³ HSE *Interim Guidance on conveying CO₂ in pipelines in connection with carbon capture and sequestration projects* (Health and Safety Executive (HSE August 2008).

⁶⁴ It should be noted that DNV (Det Norske Veritas) has published a recommended practice report – Design and Operation

However, in doing so, the designers and developers of CCS and sequestration projects “need to keep in mind that whereas natural gas is a flammable, potentially explosive substance, CO₂ is both toxic and an asphyxiant.”⁶⁵ The Guidance document is drafted with CCS projects in mind and does not specifically mention CO₂ transported by pipeline purely for EHR purposes. The position should probably be clarified, but provided the CO₂ is transported in a similar fashion and with similar technical characteristics, the general tenor of the guidance should equally apply.

9.3 Transport by road and ship

In its guidance document, HSE considers that CO₂ is most likely to be transported, from capture plant to the injection point, either by pipeline or possibly, for certain small-scale projects, by ship. The latter may then require some form of intermediate storage, though CO₂ could be injected directly from a ship in much the same way as a pipeline. Transport by road is not expressly addressed, though the CCS Association states on its website that CO₂ transport by road also remains a possibility.⁶⁶

The main requirements for carriage of dangerous goods by road are contained in the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, which implement the European Agreement concerning the International Carriage of Dangerous Goods by Road.⁶⁷ Although carbon dioxide is mentioned, we are unable to find any specific mention of carbon dioxide as a liquefied gas or being transported for EHR or CCS purposes.

Transport of dangerous goods by ship is regulated through the Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997, following which a “dangerous good” is a good which “appears in the IMDG Code or in any other IMO publication referred to in these Regulations as dangerous for carriage by sea, and any other substance or article that the shipper has reasonable cause to believe might meet the criteria for such classification”. The IMDG Code (published by the International Maritime Organization)⁶⁸ does not address explicitly the bulk transport of liquefied CO₂ for EHR or CCS purposes, but includes toxic gases (Class 2.3 substance), which should include CO₂.

10. Civil Liability Principles

This section considers in general terms the principles of civil liability that might apply should EHR operations cause damage to another person’s interests.⁶⁹ In both England and Wales, and Scotland, the core principles are derived from case law and, without detailed factual scenarios, it is difficult to make definitive conclusions. But, in broad terms, we can distinguish between the direct migration of injected CO₂, which intrudes onto, or damages, another’s person’s interests in some way, and intrusion caused by pressure from injected CO₂, which does not leave the site itself but through pressure causes other substances to intrude or damage another’s interests.⁷⁰

of CO₂ Pipelines – DNV – RP – J202 (April 2010). This applies to Pipeline transportation of anthropogenic CO₂ in the context of CCS, anthropogenic CO₂ in the context of combined CCS and EOR, CO₂ captured from hydrocarbon stream, CO₂ from natural (geological) sources for the purpose of EOR, other sources for large scale transportation of CO₂. It is approved of informally by HSE, though their guidance as not yet to be updated.
>http://www.dnv.com/industry/energy/segments/carbon_capture_storage/recommended_practice_guidelines/< accessed June 21 2013

⁶⁵ Ibid.

⁶⁶ <http://www.ccsassociation.org/faqs/ccs-transport/> accessed April 12 2013.

⁶⁷ ISBN 9789211391336 (2009 edition).

⁶⁸ IMDG Code, 2010 Edition (inc Amdt 35-10).

⁶⁹ The powers available to regulatory authorities to require remediation or clean-up such as those derived from the Environmental Liability Directive which applies to pure CCS storage sites are not considered here.

⁷⁰ Increasing the pressure in a neighbouring storage site, for example, could reduce the capacity of the site to store CO₂ (all sites will be subject to a local pressure limit, so such an increase would directly harm the economic value of the site).

10.1 Trespass

Trespass can be defined as any unjustifiable intrusion into land in the possession of another. A key principle of trespass is that it is actionable without any actual proof of damage. Although trespass is associated with the protection of interests in land, it is clear that it can extend to intrusion beneath the surface – see the 2010 decision of the Supreme Court in *Bocardo SA v Star Energy UK Onshore Ltd*.⁷¹

The core principle concerning the person who is entitled to bring an action in trespass is that they must be in possession of the land, defined as someone with a sufficient degree of physical custody and control combined with an intention to exercise such possession. Unless there is evidence to the contrary, an owner of land is deemed to be in possession. Similarly, someone holding a lease is in possession for the purposes of trespass. A licensee (in property terms rather than someone granted a regulatory licence) may also be able to sue in trespass depending on the terms of the licence and the extent to which it gives rights to the land in question.⁷²

Applying the principles to offshore activities, the Crown Estate in whom the seabed and minerals under it is vested would have title to sue in trespass. Other operators who have been granted leases by the Crown Estate would similarly have title to sue, but it is unlikely that someone who only holds a Petroleum Production Licence which does not grant any interests in land would have sufficient interest to sue in trespass. It is likely that sole licences will also possess a sufficient claim to protect their interests under trespass law.

When it comes to indirect intrusion (by pressure), it is unlikely that an action in trespass could be maintained since a core principle is that the intrusion has to be a *direct* result of the defendant's activities, rather than an indirect consequence. As Lord Denning noted in *Southport Corporation v Esso Petroleum*⁷³ where a ship had discharged oil into to an estuary which then polluted the beach:

"In order to support an action for trespass to land the act done by the defendant must be a physical act done by him directly onto the plaintiff's land... This discharge of oil was not done directly onto their foreshore but outside in the estuary. It was carried by tide on to their land but that was only consequential, not direct. Trespass, therefore, does not lie."

The distinction between direct and consequential intrusion is one that is based on the historical origins of trespass law in the United Kingdom, and in the United States courts appear to draw a far less hard line between trespass and nuisance, for example.⁷⁴ Indirect intrusion caused by pressure is more analogous to noise, which is essentially a series of pressure waves and, in that case, an action in nuisance would be more appropriate.

It is not necessary to prove that the defendant intended to trespass or should have reasonably foreseen that his actions would cause a trespass as such. But an ingredient of the action is that the movement that takes place was either intentional or negligent at the least, even though the defendant was unaware a trespass was involved.⁷⁵ Where there was no intention or negligence involved, it is likely that no trespass is involved, although the principles are not entirely clear.⁷⁶ So it is unlikely that an intrusion that occurs which was entirely unexpected and could not reasonably have been predicted would amount to a trespass in law.

⁷¹ [2011] 1 AC 380.

⁷² see *Manchester Airport plc v Dutton* [2000] QB 133 contrasted with *Countryside Residential (North Thames) Ltd* [2000] 34 EG 87 where a licence with only rights to enter the land in question for investigatory purposes did not have sufficient title to sue.

⁷³ [1954] 2 QB 182 His approach in the Court of Appeal was approved of by the majority in the House of Lords on appeal

⁷⁴ "The US Courts seem rather less hidebound by these historic distinctions and no longer differentiate between trespass and nuisance to the same extent as UK courts." Wilde M *Civil Liability for Environmental Damage* 2nd edition (Wolters Kluwer 2013, para 2.02(A))

⁷⁵ *Conarken Group Ltd v Network Rail Infrastructure* [2010] EWHC 1852 where the court suggested that where there was no intention or negligence involved, there might be no trespass.

⁷⁶ See, for example, Macbride and Bagshaw *Tort Law* (4th edition) Pearson 2012) pp 408-9.

10.2 Private nuisance and *Rylands v Fletcher*

Private nuisance is designed to protect interests associated with land and is concerned with an unreasonable interference with someone's enjoyment of property. It covers a multitude of activities including classic forms of pollution such as smell or noise, and would be applicable to direct or indirect intrusion (such as interference caused by pressure). In general terms nuisance involves a degree of 'give and take' in that the courts must come to a judgment as to what amounts to an unreasonable interference.

The core principles were recently summarised by Lord Justice Carnwath (as he then was) in *Barr and others v Biffa Waste Services Ltd*:⁷⁷

i) There is no absolute standard; it is a question of degree whether the interference is sufficiently serious to constitute a nuisance. That is to be decided by reference to all the circumstances of the case.

ii) There must be a real interference with the comfort or convenience of living, according to the standards of the average man, or in the familiar words of Knight Bruce VC:

... not merely according to elegant or dainty modes and habits of living, but according to plain and sober and simple notions among the English people" (Walter v Selfe (1851) 4 De G&Sm 315, at p 322).

iii) The character of the neighbourhood area must be taken into account. Again in familiar 19th century language, "what would be a nuisance in Belgrave Square would not necessarily be so in Bermondsey..." (20-13, citing Thesiger LJ, Sturges v Bridgman (1879) 11 ChD 852, 856).

iv) The duration of an interference is an element in assessing its actionability, but it is not a decisive factor; a temporary interference which is substantial will be an actionable nuisance (20-16).

v) Statutory authority may be a defence to an action in nuisance, but only if statutory authority to commit a nuisance is express or necessarily implied. The latter will apply where a statute authorises the user of land in a way which will "inevitably" involve a nuisance, even if every reasonable precaution is taken.

vi) The public utility of the activity in question is not a defence.

As with a trespass action, the claimant must have an interest in land which is affected. As Lord Goff explained in *Hunter v Canary Wharf*⁷⁸, "An action in private nuisance will only lie at the suit of a person who has a right to the land affected. Ordinarily, such a person can only sue if he has the right to exclusive possession of the land such as freeholder or tenant in possession or even a licensee with exclusive possession".

Negligence as such is not an ingredient of a nuisance action, though may be relevant in helping to determine whether the use of defendant's land was reasonable or not. However, where damage is caused, the courts have held that the defendant will be liable only for the type of damage that could be reasonably foreseeable at the time of the actions that caused the nuisance. In *Cambridge Water v Eastern Counties Leather plc* [1994] 2 AC 264 (spillages leaked through concrete into the ground eventually causing contamination of water supplies), there was no liability in nuisance because at the time of the spillages the court held that no-one would have predicted this particular route of contamination.

⁷⁷ [2012] EWCA Civ 312.

⁷⁸ [1997] AC 655.

This principle might be relevant to a completely unexpected form of leakage from an EHR site, though needs to be applied with caution since it refers to the *type* of damage involved rather than its particular form in the case in question. Thus a claimant could argue that leakage as such could be predicted as a problem even if the particular leakage route was not reasonably predicted.

Rylands v Fletcher is a particular form of action concerning the escape of 'dangerous things' brought onto land. Contemporary case-law views this now as a sub-set of nuisance actions and, in England and Wales, the courts have in recent years narrowed its application. In *Transco plc v Stockport Metropolitan Borough Council* [2004] 2 AC 1, the House of Lords confined its application to where a person "*has done something which he recognized or judged by the standards appropriate at the relevant place and time, he ought reasonably to have recognised, as giving rise to an exceptionally high risk of danger or mischief if there should be an escape, however unlikely an escape may have been thought to be.*"⁷⁹ It will be a matter of judgment whether an EHR activity would be considered to pose such an exceptional risk to fall within the rule, but it is probably unlikely. As with nuisance, there is only liability for the total extent of the type of damage that could be reasonably foreseen.

Although nuisance law is applicable in Scottish law, it has been held by the Scottish Court of Sessions that the suggestion that the decision in *Rylands v Fletcher* had any place in Scots law is "*a heresy which ought to be extirpated.*"⁸⁰ Any such action will fall wholly within the normal principles of nuisance law.

10.3 Negligence

Negligence is a very broad ground of action which does not depend on ownership or occupation of land as such, and can encompass personal injury as well as injury to property. Essentially the defendant must have fallen below the standards that could be reasonably expected of someone in his position at the time of the event causing damage.

10.4 Permit defence

Assuming that any damage that occurs is the result of EHR activities that were carried out in accordance with the conditions of a licence or permit, the question is whether this provides an absolute defence. In negligence cases, compliance with a permit and any others forms of guidance or codes of practice will be an extremely relevant consideration, and compliance will be helpful if not conclusive for the defence. Similarly, breach of any permit or conditions which is relevant to the cause of the damage in question will equally be relevant, and very damaging for a defendant's case.

In the *Barr v Biffa Waste* case (2012) concerning alleged nuisance caused by licensed waste disposal operations, it was suggested by the High Court that the degree of waste regulatory control was sufficiently dense that compliance with a permit ought to provide a good defence. The Court of Appeal accepted that an Act of Parliament authorising a particular activity might create a defence in limited circumstances but robustly rejected the proposition that this would apply to permits or licences: "*There is no principle that the common law should "march with" a statutory scheme covering similar subject-matter. Short of express or implied statutory authority to commit a nuisance...there is no basis, in principle or authority, for using such a statutory scheme to cut down private law rights*"⁸¹

11. Comparative examples in other Jurisdictions

This section provides a snap-shot picture of approaches to EHR/CCS regulation in a number of jurisdictions. It begins with a number of other EU Member States to see whether the CCS Directive and its application to EHR have been treated in a similar way to the United Kingdom.

⁷⁹ Per Lord Bingham, *ibid*, at [10].

⁸⁰ Per Lord Fraser, *RHM Bakers v Strathclyde Regional Council* (1985) SLT 214.

⁸¹ Per Lord Carnwath *Barr & Others v Biffa Waste Services* [2012] EWCA Civ 312 at [46].

11.1 Other EU Countries

11.1.1 Netherlands

The Dutch Mining Act (“Mijnbouwwet”) regulates the mining and storing of substances, as well as the extraction of oil and gas. The most recent evaluation of the Dutch Mining Act (“Mijnbouwwet”) notes that the Mining Act is unclear on whether CO₂ used for the process of enhanced oil or gas recovery should fall into the category of “*facilitating substance to the mining process, or whether the injection of CO₂ should be considered as a storage activity*”.⁸² The term “facilitating substance” does not appear in the Act, but refers to those substances which are used for the extraction and location of other substances (see below). The evaluation explicitly highlights the need for further analysis and clarification of the law, but pre-dated the amendments made by virtue of the Act amending the Mining Act of 6 June 2011 (“Wijziging tot de Mijnbouwwet”), which transposes the provisions of the CCS Directive.

The explanatory memorandum to the Act amending the Mining Act sheds some light on the role of CO₂ in EHR. It explains that one does not require a permit for the storage of CO₂ in situations where CO₂ is used as a “*facilitating substance*” to the extraction of oil or gas. The term “facilitating substance” (still) does not explicitly appear in the Mining Act, but the memorandum states that “*on the ground of Article 25(2) of the Mining Act, (it) will be decided by means of Decree (which substances will be classified as ‘facilitating substances’ and therefore fall outside of the general mining regime*”. This should be read in the context of Article 25(2) of the Mining Act, which states that substances may be exempt, by way of Decree, from the general obligation to obtain a storage permit.⁸³

The memorandum further explains that if CO₂ is used as a ‘facilitating substance’, the operator may not make use of the emissions trading scheme. If CO₂ is stored underground, partly for the benefit of storing CO₂ and partly to promote oil or gas extraction, then for the part that will be permanently stored the operator must obtain a storage permit. For the permanently stored CO₂ the operator will fall within the emissions trading system.

11.1.2 France

The Environmental Code, as amended to transpose the provisions of the CCS Directive, does not copy the wording of Point 20 of the Directive’s Preamble. However, it states that its provisions (on the geological storage of CO₂ for environmental reasons) do not apply to the storage of CO₂ for ‘industrial use’, as covered by Book II of the Mining Code. The difference between temporarily storing CO₂ for the ‘industrial’ purpose of EHR (as regulated by Book II of the Mining Code) and the geological storage of CO₂ for environmental reasons (as regulated by the Environmental Code) seems to lie in a) the ‘industrial’ or ‘environmental’ purpose of storing CO₂ and b) the temporary or permanent nature of the storage.

The French Mining Code (“Code Minier (nouveau)”) regulates the extraction of substances (e.g. minerals, oil and gas), as well as their underground storage. Moreover, naturally contained CO₂ was added by way of Decree (of 5 April 1965) to the list of substances which fall under the mining regime (Article L111-1) and which may be mined, subject to a permit.

The national legislation implementing the CCS Directive is the “*Décret n°2011-1411 du 31 octobre 2011 relatif au stockage géologique de dioxyde de carbone afin de lutter contre le réchauffement climatique*”,

⁸² Policy Research Corporation, commissioned by the Ministry of Economic Affairs, ‘Eindrapport: Evaluatie van de Mijnbouwwet’, 11 February 2008, p.39, Available online at: <http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2008/02/11/evaluatie-mijnbouwwet.html> [last visited: 6 March 2013].

⁸³ In implementing Article 25(2) of the Mining Act, Article 28 of the Mining Decree (also amended in 2011 to transpose the CCS Directive) lists the categories that fall outside the scope of the obligation to obtain a storage permit, including substances that are used for the location and extraction of minerals (in Dutch ‘delfstoffen’) and geothermal heat (Art.28(b)(1)). ‘Delfstoffen’ is defined in the Mining Act itself as “*minerals or substances of organic origin, present in the subsoil by natural concentration or deposit, in solid, liquid or gaseous state, with the exception of source gas, limestone, gravel, sand, clay, shells and mixtures thereof*”. Moreover, it appears from the Annual Report 2011 on Minerals and Geothermal Heat that ‘delfstoffen’ includes oil and gas, because the report treats the extraction of these at length

by virtue of which several amendments have been made to the chapter entitled “Greenhouse Effect” in the Environmental Code (“Code de l’Environnement”). However, Article L229-32 of Section 6 of the Environmental Code (this section regulates the storage of CO₂) explicitly states it does *not* apply to the storage of CO₂ for industrial purposes, as regulated by Book II of the Mining Code (“Code Minier (nouveau)”).

Book II of the Mining Code, as amended by Law No. 2003-8 of 3 January 2003 relative to the gas and electricity markets and energy, lays down the legal framework for the storage of natural gas, liquid, liquefied or gaseous hydrocarbons; or chemical products for industrial use. Neither the Mining Code nor the Environmental Code explicitly refers to EHR or to the reinjection of substances (e.g. CO₂) other than for environmental reasons. However, it appears that this is covered by Book II of the Mining Code.⁸⁴ It should be noted that any storage pursuant to Book II is subject to the general provisions of the Mining Code, such as its provisions on financial security, sufficient technological capacity and post-closure obligations, as well as several additional requirements. Storing substances pursuant to Book II requires a permit, which is valid for 50 years. Whilst the permit may be renewed, it would clearly not cover the *permanent* storage of CO₂. However, whilst stored substances should be removed at the end of the duration of the validity of the permit, some may remain ‘trapped’ for physicochemical reasons.⁸⁵

11.2 Norway

Norway currently regulates the storage of CO₂ by way of the Petroleum Activities Act 1996,⁸⁶ the Pollution and Waste Act 1981 and the Act on Research, Exploration and Exploitation of Natural Resources other than Petroleum on the Ocean Floor 1963 (the “Continental Shelf Act”).⁸⁷

The Continental Shelf Act applies to the exploration for and exploitation of sub-sea natural resources other than petroleum resources in Norwegian internal waters, in the Norwegian territorial sea and on the continental shelf, and vests the right to submarine natural resources in the State. As such, the Continental Shelf Act authorises the Ministry of Petroleum and Energy (with regard to licensing and resource management issues) and the Ministry of Labour (with regard to health and safety) to license the transport and storage of CO₂ where this does not stem from petroleum activities. The Act contains no detail, but provides at Section 2 that “*conditions for permissions (to explore or exploit natural resources) may be stipulated*”.

The Petroleum Activities Act explicitly regulates “improved recovery” (Section 1-6) and as such regulates the storage of CO₂ from petroleum activities. Moreover, EOR seems to be encouraged considering that Section 4-1 contains an obligation to produce as much of the petroleum in place in each deposit, and “*the licensee shall carry out continuous evaluation of production strategy and technical solutions and shall take the necessary measures in order to achieve this*”.

The Petroleum Activities Act leaves a lot of discretion to the administrative bodies with regards to the exact requirements for any activity; for example, only general criteria are given on what should be included in a plan for development and operation of a petroleum deposit (i.e. resource aspects, technical and safety aspects, information on decommissioning and utilisation, etc.) allowing the Ministry to “*require the licensee to produce a detailed account of the impact on the environment, possible risks of pollution and the impact on other affected activities, in respect of a larger defined area*” (Section 4-2). Moreover, the Ministry may require that on-going production be continued or increased where they deem this economically beneficial to society (Section 4-6). When a production licence expires or is surrendered, the Ministry makes a decision on disposal, to which the Ministry may attach specific conditions. A

⁸⁴ Bersani, F., ‘Rapport: Les Stockages Souterrains de Gaz Carbonique – Cadrage Juridique’, 5 April 2006, Available online at:

<http://www.ladocumentationfrancaise.fr/var/storage/rapports-publics/074000391/0000.pdf> [last visited: 6 March 2012].

⁸⁵ *Ibid*, p.28.

⁸⁶ Act 29 November 1996 No. 72 relating to petroleum activities, Available online at: <http://www.npd.no/en/Regulations/Acts/Petroleum-activities-act/> [last accessed 12 March 2013].

⁸⁷ Act of 21 June 1963 No. 12 relating to scientific research and exploration for and exploitation of subsea natural resources other than petroleum resources, Available online at:

<http://www.npd.no/en/Regulations/Acts/Scientific-research-act/> [last accessed 12 March 2013].

decision may also be to the effect that the facility shall continue to be used "for petroleum activities or other purposes" (Section 5-3). More explicitly with regard to CO₂ storage, it provides at Section 4.8 that "the Ministry may (...) decide that facilities may be used by others in connection with treatment, transportation and storage of CO₂", and as such the Act appears to foresee a level of overlap between petroleum extraction and CO₂ storage. It therefore seems possible and even likely that CO₂ used in EHR may subsequently be permanently stored under the provisions of the Petroleum Activities Act, subject to conditions stipulated by the Ministry. However, lacking any CCS specific provisions, it is unclear whether there is a "cut-off" point at which CO₂ used in EOR is considered to be CO₂ storage and whether a specific (and possibly different) regime applies.

According to Bugge and Ueland, the most recent efforts (a Royal Decree dating from 2009) to transpose the CCS Directive is being prepared pursuant to the Continental Shelf Act. However, Bugge and Ueland consider it likely that the legislation covering EOR processes combined with the permanent storage of CO₂ will follow those CCS specific regulations.⁸⁸

Considering that as yet no CCS specific legislation has been proposed, it would appear that the storage of CO₂ where this does *not* stem from petroleum activities may be licensed by the Ministry of Petroleum and Energy and the Ministry of Labour, and that the permanent storage of CO₂ where this stems from petroleum activities (i.e. EOR) is regulated under the Petroleum Activities Act. Where and how this overlaps with CO₂ from non-petroleum activities and/or where CO₂ subsequently gets permanently stored is unclear. From the above, it would seem that specific conditions for CO₂ storage where this stems from petroleum activities, whether stored during the petroleum extraction activities or subsequently permanently stored, are likely to be stipulated by the Ministry as part of the petroleum licence granted to the operator.

11.3 Australia

In Australian jurisdictions, injection of CO₂ as a component of enhanced hydrocarbon recovery (EHR) operations is regulated as a subspecies of petroleum development.⁸⁹ Subject to various conditions, petroleum licensing frameworks generally provide for the injection of CO₂ and other substances in order to enhance recovery.

Laws and regulations concerning greenhouse gas storage⁹⁰ are not applied to EHR operations, unless such operations are also undertaken for storage purposes.⁹¹ The following statement is indicative of how the purpose of an operation is determined by the Minister on a case-by-case basis under Commonwealth legislation:

'Any injection and storage of greenhouse gas substances must be appropriate to the size and nature of the petroleum operation. Otherwise, a greenhouse gas title is required. This ensures that the need to obtain a greenhouse gas title is not avoided under cover of

⁸⁸ Hans Christian Bugge, Andre Lamark Ueland, "Case studies on the implementation of Directive 2009/31/EC on the geological storage of carbon dioxide: Norway", available online at: ><http://www.globalccsinstitute.com/publications/case-studies-implementation-directive-200931ec-geological-storage-carbon-dioxide-norway><[accessed 12 March 2013].

⁸⁹ The Commonwealth and Australian states have adopted relatively consistent legal and regulatory approaches to EHR. These approaches were influenced by 'Regulatory Guiding Principles for Carbon Dioxide Capture and Geological Storage', which were adopted in November 2005 by the Ministerial Council on Mineral and Petroleum Resources, with the aim of achieving a nationally consistent legal and regulatory framework in each Australian jurisdiction.

⁹⁰ Australian regulatory frameworks also cover the injection of gases (referred to in most jurisdictions as 'greenhouse gases') other than CO₂. See, e.g. Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) section 7.

⁹¹ See, e.g. Clean Energy Division, Department of Resources, Energy and Tourism (Commonwealth), Guidelines for injection and storage of greenhouse gas substances in offshore areas (December 2011), which notes as follows: 'Petroleum production licensees can inject a GHG substance from any source for purposes relating to the recovery of petroleum (enhanced hydrocarbon recovery) without a GHG injection licence. In this case, the injection operation would be approved and administered as part of the field development plan. However, if the injection of the GHG substance is for the purposes of disposing of the GHG, then the petroleum titleholder would be subject to the GHG injection and storage provisions of the Act and would need to obtain a GHG title.'

'enhanced oil recovery'.⁹²

Design features of relevant Commonwealth, state and territory legislation are summarised below:

Commonwealth

Petroleum licences issued in accordance with the Offshore Petroleum and Greenhouse Gas Storage Act 2006 confer, inter alia, a conditional right to:

- inject a substance into the seabed or subsoil of an offshore area;
- store (whether on a permanent basis or otherwise) a substance in the seabed or subsoil of an offshore area.⁹³

The Minister may also issue regulations that authorise petroleum licensees to explore for potential greenhouse gas storage formations or greenhouse gas injection sites within the relevant licence area.⁹⁴

State and territory level

Queensland – Petroleum development activities are licensed in accordance with the Petroleum Act 1923 and Petroleum and Gas (Production and Safety) Act 2004. Greenhouse gas storage activities are licensed under the Greenhouse Gas Storage Act 2009. The former Acts prohibit Petroleum licensees from undertaking 'greenhouse gas stream storage'.⁹⁵ However, the latter Act declares that 'injecting a greenhouse gas stream for the purpose of enhanced petroleum recovery authorised under ... [the former Acts] ... is not greenhouse gas storage'.⁹⁶

Victoria – The Offshore Petroleum and Greenhouse Gas Storage Act 2010 is drafted in very similar terms to those found in Commonwealth legislation (summarised above).⁹⁷ In an onshore context, the Petroleum Act 1998 permits a licensed petroleum operator to inject CO₂ for the purpose of EHR.⁹⁸

South Australia – Petroleum development and 'gas storage' activities (including CO₂ storage) are licensed under the Petroleum and Geothermal Energy Act 2000. Subject to relevant conditions, the Act specifically permits petroleum licensees to undertake injection of petroleum or another substance into a natural reservoir for the recovery (or enhanced recovery) of petroleum.⁹⁹ Subject to relevant conditions, it also permits petroleum licensees to undertake several other activities if they are reasonably necessary for, or incidental to, petroleum development, including:

- utilisation of a natural reservoir to store petroleum or another regulated substance (including CO₂);
- injection of water or some other substance into a natural reservoir in order to enhance production of petroleum or another regulated substance.¹⁰⁰

Other jurisdictions – the Australian Capital Territory, New South Wales, the Northern Territory, and Western Australia have yet to establish comprehensive legislation concerning CO₂ injection and storage.¹⁰¹ Bills with similar design features to those identified above have been published in New South

⁹² Explanatory Statement: Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011 (SLI No. 54 of 2011).

⁹³ Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) section 98(1)-(2), 161(1)-(2).

⁹⁴ Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) section 98(3), 161(3).

⁹⁵ Petroleum and Gas (Production and Safety) Act 2004 (Qld) section 109(2).

⁹⁶ Greenhouse Gas Storage Act 2009 (Qld) section 14.

⁹⁷ Offshore Petroleum and Greenhouse Gas Storage Act 2010 (Vic) sections 73 and 150.

⁹⁸ See Petroleum Act 1998 sections 6, 8, 46. See also Department of Primary Industries (Vic), A Regulatory Framework for the Long-Term Underground Geological Storage of Carbon Dioxide in Victoria (Discussion Paper January 2008).

⁹⁹ Petroleum and Geothermal Energy Act 2000 (SA) sections 21, 34.

¹⁰⁰ Petroleum and Geothermal Energy Act 2000 (SA) section 10.

¹⁰¹ It is extremely unlikely that a need for such legislation will arise in the ACT. Note also that the Barrow Island Act 2003 (WA) establishes a project-specific regulatory framework for CO₂ injection and storage undertaken as part of the Gorgon liquefied natural gas project: See Andrew Beatty et al, The Gorgon Project: Legal and Policy Issues

11.4 United States

The United States has over forty years experience of the use of CO₂ in connection with oil recovery with annual injections estimated to be around 65 million metric tonnes per year in more than 7,200 injection wells.¹⁰³ A very detailed account of the legal regime is contained in Marston's recent report for the Global Carbon Capture Storage Institute.¹⁰⁴ The core regulatory standards for injection wells have been made by the US EPA under the 1974 Safe Drinking Water Act (SDWA) (42 USC 300) and are designed to protect underground sources of drinking water. Rules made under the SDWA provide minimum standards, allowing States to develop more stringent standards (in this respect similar to an EU Directive, such as the CCS Directive, made under the environmental provisions of the Treaty, which allow Member States to set more stringent standards).

Under its Underground Injection Program the EPA identified five classes of wells with Class II wells defined as wells that inject fluids which are (i) brought to the surface in connection with conventional oil or natural gas production (ii) used for enhanced recovery of oil or natural gas and (iii) used for storage of hydrocarbons which are liquid at standard pressure. Class II regulations adopted by State programmes now govern injection and incidental storage of CO₂ during EOR operations. These have now been supplemented by new rules requiring operators to report on net injections in EOR operations.¹⁰⁵

In 2010, the EPA adopted a rule establishing new Class VI regulations where wells were used to inject CO₂ for the purpose of long-term storage.¹⁰⁶ EPA decided to preserve the less stringent requirements of Class II requirements for CO₂ injection associated EOR operations based on the different risk profiles:

'Traditional E[O]R projects are not impacted by this rulemaking and will continue operating under Class II permitting requirements. EPA recognizes that there may be some CO₂ trapped in the sub-surface at these operations; however, if there is no increased risk to USDWs, then these operations would continue to be permitted under Class II'.¹⁰⁷

The regulatory challenge where a pure EOR operation changes into one where the primary purpose is the storage of CO₂ is one facing many jurisdictions, and the EPA appeared to go further than most regulators in other jurisdictions in elaborating relevant procedures and principles. As Marston notes,¹⁰⁸

"EPA endeavoured to structure a transition pathway by which Class II wells could be re-permitted as Class VI wells for storage purposes when EOR operations come to an end. While the Class VI rules do not apply to Class II being used for EOR operation as long as any oil or gas production is 'simultaneously occurred' from the same formation, an operator who wants to continue to inject CO₂ in a formation after completion of the oil and gas

(UCL CCLP Think Piece) available at <<http://blogs.ucl.ac.uk/law-environment/files/2012/12/Think-piece-5-Beatty.pdf>>.

¹⁰² Greenhouse Gas Storage Bill 2010 (NSW) and Petroleum and Geothermal Energy Legislation Amendment Bill 2012 (WA).

¹⁰³ 2012 Worldwide EOR Survey 2012 Oil and Gas Journal 110 (4).

¹⁰⁴ Philip Marston (2013) *Bridging the Gap – An Analysis and Comparison of Legal Regulatory Frameworks for CO₂-EOR and CO₂-CCS* (Global Carbon Capture Storage Institute, 2013). For CO₂ transportation legislation in the US see as well Lawrence J Wolfe 'CO₂ Transportation and Regulation, CCS and EOR' in Havercroft, Macrory and Stewart *Carbon Capture and Storage – Emerging Legal and Regulatory Issues* (Hart Publishing 2011).

¹⁰⁵ US EPA (2010) *Final Rule: Mandatory Reporting of Greenhouse Gases : Injection and Geological Sequestration of Carbon Dioxide* (sub-part UU) 75 Fed. Reg. 75060.

¹⁰⁶ US EPA *Final Rule : Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geological Sequestration (GS) Wells* 75 Fed Reg 772230.

¹⁰⁷ *Ibid*, 77245 and quoted in Marston (2013) *supra*.

¹⁰⁸ Marston (2013) 113 seq.

operations will need to obtain a Class VI permit under a specific set of requirements.”

Under the rules, the responsibility for deciding when a well moves from Class II to Class VI rests with the UIC program director unless the operator makes their own application. Risk-based factors that can determine whether Class VI requirements should apply include:

- (I) increase in reservoir pressure
- (II) increase in CO₂ injection rates
- (III) decrease in reservoir production rates
- (IV) the distance between the injection zone and USDWs
- (V) suitability of the Class II area of review delineation
- (VI) quality of the abandoned well plugs within the Area of Review Delineation
- (VII) operator's plan for the recovery of CO₂ at the cessation of injection
- (VIII) source and properties of the injected CO₂
- (IX) additional site-specific factors as determined by the UIC Program Director

The EPA is proposing to produce a draft Guidance Document on transition pathways in addition to various guidance documents already produced in connection with Class VI Wells.

11.5 Alberta, Canada

There are over 60 EOR projects in Alberta, although for many years only one of them involved the use of CO₂.¹⁰⁹ The Joffre Viking EOR project began to use CO₂ in the 1980s, to revive production at an otherwise exhausted oil field, because a nearby ethylene plant was producing CO₂ as a waste product. Elsewhere, economic and accessible supplies of CO₂ were scarce, so most EOR projects used hydrocarbon flooding instead.¹¹⁰ The development of climate change mitigation policies in recent years has made CO₂ flooding techniques more attractive, both economically and as a way of meeting policy goals. Various surveys have also suggested that there is considerable resource recovery potential from using CO₂-EOR in Alberta's oil fields.¹¹¹

In 2003, CO₂ use in enhanced recovery operations was actively encouraged with the adoption of the CO₂ Projects Royalty Credit Regulation, under the Mines and Minerals Act, which offered carbon credits for the use of CO₂ (defined as 'a gaseous mixture consisting mainly of carbon dioxide), in enhanced oil and gas recovery.¹¹² In July 2008, the Alberta Government further recognised the role that CO₂-EOR could play in its climate change strategy, when three of the four projects chosen for funding as part of a C\$2 billion programme to demonstrate the viability of carbon capture and storage (CCS) included EOR.¹¹³

Alberta also has a history of injecting substantial quantities of CO₂ into deep geological formations as part of acid gas disposal (AGD), which began near Edmonton in 1989. The main purpose of this is to reduce atmospheric emissions of hydrogen sulphide (H₂S), after both H₂S and CO₂ are stripped out of sour oil and gas streams in the Alberta Basin, in order to 'sweeten' them before they can be sent to market. The acid gas, which can contain up to 95% CO₂, is injected into a wide range of saline aquifers and depleted hydrocarbon reservoirs, in a process that has been seen as a commercial-scale analogue

¹⁰⁹ See Stefan Bachu, 'Legal and regulatory challenges in the implementation of CO₂ geological storage: An Alberta and Canadian perspective,' *International Journal of Greenhouse Gas Control* (2008).

¹¹⁰ The largest CO₂-EOR operation in Canada, the Weyburn-Midale project, which imports CO₂ by pipeline from a coal gasification plant across the US border in North Dakota, lies in the neighbouring province of Saskatchewan.

¹¹¹ See, for example,

<<http://www.albertatechfutures.ca/RDSupport/Petroleum/UnconventionalNaturalGasandLightOilRecovery/EnhancedOilRecovery/GasandMiscibleFlooding.aspx>>

¹¹² Mines and Minerals Act CO₂ Projects Royalty Regulation (120/2003).

¹¹³ The Alberta Carbon Trunk Line (ACTL), developed by Enhance Energy Inc, (which will collect CO₂ from Alberta's Industrial Heartland and transport it to mature oil fields in south central Alberta (<http://www.enhanceenergy.com/actl>)), the Swan Hills Synfuels project and TransAlta's Project Pioneer. The last two have since withdrawn from the programme.

to CCS.¹¹⁴ By the end of 2003, 2.5Mt of CO₂ and 2.0Mt of H₂S had been injected at 48 sites.

With that background, CO₂-EOR schemes in Alberta are currently regulated by the province's Energy Resources Conservation Board (ERCB), by means of a series of regulatory directives under the Oil and Gas Conservation Act,¹¹⁵ and by Alberta Environment and Sustainable Resource Development (AESRD), under the Alberta Environmental Protection and Enhancement Act. There may also be a need to obtain a sub-surface rights agreement, under the provincial Mines and Minerals Act, and an environmental impact assessment from Natural Resources Canada (NRCan), under the (federal) Canadian Environmental Assessment Act 2012. In terms of injection requirements, CO₂-EOR is treated according to the rules for acid gas disposal (normally Class III disposal wells), under ERCB Directive 065.

The legislation adopted in Alberta to deal with CCS, the Carbon Capture and Storage Statutes Amendment Act 2010, does not specifically address CO₂-EOR. As a result, several of the working groups established under the government's Regulatory Framework Assessment (RFA) process in 2011, to develop recommendations for detailed regulation of CCS, were asked to review the adequacy of the current regulations for CO₂-EOR. While the RFA has yet to formally report, there has been much discussion about the need to define more clearly the differing rules for CO₂ sequestration, AGD and CO₂-EOR. There has also been some talk of creating a separate, mini-RFA process, to look specifically at CO₂-EOR, although as yet there is no confirmation of that.

The principal focus of discussion has been the rules to govern transition from a CO₂-EOR project to a CCS one, both for new and for existing EOR projects. Under the 2010 CCS legislation and the forthcoming implementing regulations, the regulatory regime for CO₂ sequestration, under a Carbon Sequestration Lease, will require additional activities than that for current CO₂ AGD regulation under section 54(5) of the Mines and Minerals Act. The rules will differ in terms of aspects such as sub-surface monitoring of the CO₂ plume, composition of the injected stream and post-closure transfer of responsibility.

Up to now, all sub-surface injection of CO₂ has been classified as AGD under the ERCB's Directive 065, but the introduction of the Carbon Sequestration Lease will allow the alternative option of 'CO₂ sequestration'. As things stand, new operators could choose either registration. Carbon offset credits can be obtained for any new CO₂ that is verified as injected and contained within the geological formation, for either resource recovery or sequestration purposes. For an EOR project, newly injected volumes have to be measured and verified by a third party; whereas CO₂ that is re-cycled, together with any entrained methane that comes to the surface with the oil, does not qualify for a credit.

There is currently no regulation allowing a project operating as CO₂-EOR for most of its active life to change its registration to CO₂ sequestration as it nears the end of the injection period. Among other things, such a change could allow the operator to transfer liability to the state after closure, a protection that is not currently offered to oil and gas producers, nor to AGD. In addition: the hydrocarbon reservoir developed by EOR would not necessarily have met the site selection criteria for sequestration (caprock seals, legacy wells, etc); the reservoir might not meet the minimum depth (1,000m) or tenure requirements; the monitoring, measurement and verification (MMV) practices would have been different; and different requirements would have existed in relation to financial security and contributions to cover post-closure care. The question of how best to handle such differences will be at the heart of any future examination of possible transition between the two regimes. Some concern has also been expressed about public perception, including possible misunderstandings about risk exposure, if the regulatory requirements for apparently similar activities (CO₂ sequestration, CO₂-EOR and AGD) differ substantially.

¹¹⁴ Stefan Bachu and William D Gunter, *Overview of Acid-Gas Injection Operations in Western Canada*; Stefan Bachu, J J Adams, K Michael and B E Buschkuehle, *Acid Gas Injection in the Alberta Basin: a Commercial-Scale Analogue for CO₂ Geological Sequestration in Sedimentary Basins*.

¹¹⁵ The main ones are: Directive 051 (covering wellbore integrity and completion requirements), Directive 056 (pipeline licences, compression and EOR site facilities) and Directive 065 (resource applications and injection well licences). Directive 006 concerns the liability management framework and contributions to the orphan well fund.