



Commission for Energy Regulation

An Coimisiún um Rialáil Fuinnimh

Safety Case Guidelines

Part of the Petroleum Safety Framework

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Glossary of Terms and Abbreviations

List of Abbreviations

Abbreviation	Meaning
AIS	Automatic Identification System
ALARP	As Low As is Reasonably Practicable
ARPA	Automatic Radar Plotting Aid
BOP	Blow-out Preventer
CAS	Chemical Abstract Service
CER	Commission for Energy Regulation
HVAC	Heating Ventilation Air Conditioning
ICB	Independent Competent Body
IUPAC	International Union of Pure and Applied Chemistry
MAH	Major Accident Hazard
NUI	Normally Unattended Installation
PDCA	Plan Do Check Act
POB	Persons on Board
QRA	Quantified Risk Assessment
SCE	Safety Critical Element
SMS	Safety Management System
TEMPSC	Totally Enclosed Motor Propelled Survival Craft

List of Defined Terms

Words and phrases defined in section 13A of the Act shall, unless the context otherwise requires, have the same meanings when used in this document.

Term	Definition or Meaning
(the) Act	The <i>Electricity Regulation Act 1999</i> as amended, inter alia, by the <i>Petroleum (Exploration and Extraction) Safety Act 2010</i> .
ALARP Guidance	The <i>ALARP Guidance</i> document describes processes that must be used to determine whether a risk is ALARP. The <i>ALARP Guidance</i> document, as amended from time to time, forms part of the Framework.
Compliance Assurance System	The <i>Compliance Assurance System</i> document describes processes used to assure compliance with the Act and the Framework. The <i>Compliance Assurance System</i> document, as amended from time to time, forms part of the Framework.
Designated Petroleum Activities Regulations	The <i>Petroleum Safety (Designation of Certain Classes of Petroleum Activity) Regulations 2013</i> , (Statutory Instrument 89 of 2013).
Exclusion Criteria	The following criteria listed under Section 13AC(2) of the Act on the basis of which information may be excluded from the public version of an approved safety case: industrial, commercial or personal confidentiality, public security or national defence.
Facilities Verification Scheme	A Facilities Verification Scheme is a description of the work carried out by Independent Competent Body(s) to verify whether a petroleum undertaking has identified and continues to meet suitable performance standards for SCEs for pipelines and Facilities (except wells).
Facility	A piece of petroleum infrastructure other than a pipeline.
Framework	The Petroleum Safety Framework established under section 13I of the Act that comprises a collection of regulations, written regulatory documents and procedures which, taken together, describe the system the CER will use to regulate the activities of petroleum undertakings with respect to safety.
(the) General Duty	<p>The duty placed on petroleum undertakings by section 13K of the Act, being the duty to ensure that:</p> <ol style="list-style-type: none"> a) any petroleum activity is carried on in such a manner as to reduce any risk to safety to a level that is As Low As is Reasonably Practicable (ALARP); and b) any petroleum infrastructure is designed, constructed, installed, maintained, modified, operated and decommissioned in such a manner as to reduce any risk to safety to a level that is ALARP.

Term	Definition or Meaning
Good Practice	The recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities.
(the) Guidelines	The <i>Safety Case Guidelines</i> prepared by the CER under section 13L of the Act relating to the preparation and appropriate contents of safety cases for petroleum undertakings. The <i>Safety Case Guidelines</i> , as amended from time to time, form part of the Framework.
High Level Design	The <i>High Level Design of the Petroleum Safety Framework</i> as amended by the CER from time to time.
Independent Competent Body	An independent organisation engaged by the petroleum undertaking, under the Compliance Assurance System, to execute a Facilities Verification, or Well Verification Scheme.
Major Accident	An event, such as a major emission, fire, explosion, impact or structural failure of Petroleum Infrastructure, resulting from uncontrolled developments in the course of petroleum activities that could lead to a serious danger to human health whether immediate or delayed. Serious danger implies events which could impact multiple persons, including members of the public and/or workforce.
Major Accident Hazard	A hazard that if realised could result in a Major Accident.
Non-production Installation	Mobile offshore or onshore equipment involved in exploration or well work activities such as drilling, interventions, workovers and well testing. Such installations do not normally carry out processing or export of well fluids although some process equipment may be involved in well testing. Unlike a Production Installation, a Non-production Installation is not permanently stationed on site.
Petroleum Incident Regulations	The <i>Petroleum Safety (Petroleum Incident) Regulations 2013</i> .
Production Installation	A Production Installation is equipment used in the exploitation and/or processing of reservoir fluids. It refers to installations permanently stationed for the carrying out exploitation activities and so includes both fixed (onshore/offshore) and floating installations and associated pipelines. A floating production storage and offloading vessel is a Production Installation due to the permanent nature of its connection to the reservoir whereas a shuttle tanker is not.
Residual Risk	The risk that remains once a risk reduction measure has been implemented.
Risk Reduction Measure	A measure that reduces the risk from a hazard.

Term	Definition or Meaning
Safety Permit Application Guidelines	A document that describes the CER's assessment process, including timescales, for the safety cases submitted by petroleum undertakings. The <i>Safety Permit Application Guidelines</i> , as amended from time to time, form part of the Framework.
Safety Critical Element	Safety Critical Elements are such parts of a Facility and its plant, including computer programs, a purpose of which is to prevent or limit the effect of a Major Accident, or the failure of which could cause or contribute substantially to a Major Accident.
Safety Management System (SMS)	With respect to the petroleum activities carried on or proposed to be carried on under a safety case, means the framework of policies, processes and procedures that are required to enable the petroleum undertaking to manage its safety risks and continually improve its safety performance.
Well Verification Scheme	A Well Verification Scheme is a description of the work carried out by Independent Competent Body(s) to verify whether a petroleum undertaking has identified and continues to meet suitable performance standards for well-related SCEs and that well integrity is maintained.
Well Work Activity	An activity that alters the pressure containment boundary of a well; or introduces wire, cable or hollow pipe into a well. Such an activity requires a Well Work Safety Permit.
Verification Scheme	Denotes the Facilities Verification Scheme and/or the Well Verification Scheme.

1 Introduction

1.1 *Petroleum Safety Framework*

The *Electricity Regulation Act 1999*, as amended *inter alia* by the *Petroleum (Exploration and Extraction) Safety Act 2010* (the Act) gives the Commission for Energy Regulation (CER) responsibility for the safety regulation of petroleum exploration and extraction activities in Ireland. The Act requires the CER to establish and implement a risk-based petroleum safety framework (referred to in this document as the Framework). The Framework is the overall system established by the CER to regulate the safety of petroleum activities¹ and in particular designated petroleum activities,² carried out by petroleum undertakings.³ The Framework established under the Act is a permitting regime, is goal-setting and risk-based, whereby petroleum undertakings are required to reduce risks to a level that is as low as is reasonably practicable (ALARP).

1.2 *The Safety Case Guidelines*

These *Safety Case Guidelines* (the Guidelines) have been prepared and published by the CER pursuant to section 13L of the *Electricity Regulation Act 1999*, as amended *inter alia* by the *Petroleum (Exploration and Extraction) Safety Act 2010* (the Act).

The Act requires all petroleum undertakings⁴ that carry on designated petroleum activities⁵ to submit a safety case to the Commission for Energy Regulation (CER)⁶ with respect to that designated petroleum activity. The Act prescribes certain things that have to be included in a safety case⁷ and the minimum conditions that must be satisfied in order for the CER to approve it.⁸ All safety cases submitted to the CER under the Act are required to be prepared in accordance with these Guidelines.⁹ In respect of a designated petroleum activity or activities, each safety case must at least contain the particulars specified in these Guidelines that relate to that activity.¹⁰

¹ As defined in section 13A(2) of the Act.

² As defined in the *Designated Petroleum Activities Regulations*.

³ As defined in section 13A(1) of the Act.

⁴ As defined in section 13A(1) of the Act.

⁵ As defined in the *Designated Petroleum Activities Regulations*.

⁶ Section 13M of the Act.

⁷ Section 13M(4) of the Act.

⁸ Section 13P(1) of the Act.

⁹ Section 13M of the Act.

¹⁰ Section 13M(4) of the Act.

1.3 **The Safety Case Permissioning System**

1.3.1 **Overview**

The Act establishes a permissioning system for certain petroleum activities that are classed as *designated petroleum activities*. A petroleum undertaking shall not carry on a designated petroleum activity (other than an established petroleum activity) unless:

- a) It has submitted a safety case to the CER;
- b) The CER has approved the safety case; and
- c) A safety permit has been issued in respect of the designated petroleum activity.¹¹

A petroleum undertaking carrying on an established petroleum activity must also submit a safety case to the CER within the time period specified in the Act.¹² The CER may only issue a safety permit in respect of a designated petroleum activity where it has approved a safety case submitted in respect of that activity.

Responsibility for safety rests with each petroleum undertaking and each petroleum undertaking must satisfy itself as to the adequacy and implementation of measures to reduce risks to safety to the levels required by the Act; this must be demonstrated within its safety case.

Approval of a safety case by the CER and the issuing of a safety permit shall not be interpreted as relieving a petroleum undertaking of its duties under the Act.

1.3.2 **Classes of Designated Petroleum Activities and Required Safety Permit**

Safety cases are required to be prepared and submitted in respect of designated petroleum activities. The *Designated Petroleum Activities Regulations* prescribe three classes of petroleum activity that are designated petroleum activities. These relate to:

- Well work activities;
- Production activities; and
- Decommissioning activities.

Under the Framework, the CER will grant three broadly corresponding safety permits, each in respect of a class of designated petroleum activity. These are a:

- a Well Work Safety Permit;
- a Production Safety Permit; and
- a Decommissioning Safety Permit.

In order for a safety permit to be issued, a safety case, or number of safety cases have to be approved, as set out in Table 1 below.

¹¹ Section 13M of the Act.

¹² Section 13M of the Act.

Class of Designated Petroleum Activity	Required Safety Permit	Prerequisite Safety Case(s)
Well Work	Well Work Safety Permit	Well Work Safety Case; and Non-production Safety Case ¹³ ; <u>or</u> Production Safety Case ¹⁴
Production	Production Safety Permit	Design Safety Case (in some cases); and Production Safety Case
Decommissioning	Decommissioning Safety Permit	Decommissioning Safety Case

Table 1: Class of designated petroleum activity, required Safety Permit and prerequisite safety case

It should be noted that insofar as the safety case requirements prescribed by the Framework are in respect of classes of *petroleum activities* (and not *petroleum infrastructure*), the scope of an individual safety case will depend on the nature of the petroleum activity to which it relates and the circumstances in which the petroleum activity is to be carried out. Guidance on the scope of the individual safety cases is given in the relevant sections of these Guidelines (sections 4 to 8).

For activities requiring a Well Work Safety Permit, a Production Safety Case or Non-production Safety Case will generically describe the petroleum activities that can be carried on by such an installation. Then, amongst other things, the Well Work Safety Case must state and demonstrate that the said installation is suitable to safely carry out the Well Work Activity.

1.3.3 Definition of Well Work Activity Requiring a Well Work Safety Permit

As defined in the *Petroleum Safety (Designation of Certain Classes of Petroleum Activity) Regulation 2013, S.I. 89 of 2013*, any petroleum activity or discontinuance of a petroleum activity in relation to well is a designated activity and therefore needs a Well Work Safety Permit or a Production Safety Permit. To this end, Well Work Activity, which requires a Well Work Safety Permit before it can commence, is defined to be any petroleum activity that:

- Alters the pressure containment boundary of a well; or
- Introduces wire, cable or hollow pipe into a well.

Examples of Well Work Activities include, but are not limited to:

- The addition of well control equipment to allow the safe access of equipment into the well (for example to temporarily introduce wire, cable or hollow pipe into the well in order to wireline);
- The process used to fit a safety valve insert to substitute a failed safety valve in a well; and
- The temporary plugging of certain flow paths to allow the repair or replacement of Safety Critical Elements).
- Digging, drilling, boring, or sinking of shafts for the purposes of raising petroleum;

¹³ If the Well Work Activity is being carried out by a Non-production Installation.

¹⁴ If the Well Work Activity is being carried by a Production Installation.

- Completion of wells;
- Well interventions and workovers; and
- Plugging, blocking, capping, or abandonment of any well whether temporarily or permanently.

For a well under a Production Safety permit, activities that do not change the normal pressure containment boundary of the well or introduce wire, cable or hollow pipe into the well are not Well Work Activities and can be carried on pursuant to being included Production Safety Case. Examples of such designated petroleum activities include, but are not limited to:

- Production through an existing completion;
- Formation stimulation operations where the pressure containment boundary is not altered, e.g. acidizing or chemical injection by bullheading; and
- Well testing through an existing completion.

If the above activities are being carried on from a non-production installation as, for example, part of a well test, they would need to be included in the combination of the Well Work Safety Case and the Non-production Safety Case.

1.3.4 Demonstration Requirements within Safety Cases

Each safety case submitted by a petroleum undertaking must be in accordance with the Safety Case Guidelines and include, in combination with any other safety case required to be submitted in respect of the same designated petroleum activity, sufficient particulars to demonstrate to the CER that the petroleum undertaking: Is complying with its General Duty;

- a) Has the ability to properly assess and effectively control risks that may arise from the carrying on of the designated petroleum activity or activities to a level that is ALARP;
- b) Having identified all hazards and assessed the risks presented by those hazards, has taken such measures as are adequate to ensure that its safety management system is capable of reducing the risks to a level that is ALARP;
- c) Has evaluated all petroleum incident risks and emergency measures are in place in the event of such petroleum incident arising; and
- d) Has adequate arrangements established for monitoring, audit and for the making of reports on safety performance and compliance.
- e) Has adequate arrangements established for monitoring, audit and for making of reports on safety performance and compliance.

1.4 Structure and Interpretation

1.4.1 Structure of Document

The Guidelines are divided into a further 8 sections:

- Guidelines on the Preparation of All Safety Cases (section 2);
- Prescriptive Requirements (section 3);
- Requirements for Production Safety Cases (section 4);
- Requirements for Well Work Safety Cases (section 5);
- Requirements for Non-production Safety Cases (section 6);
- Requirements for Design Safety Cases (section 7);

- Requirements for Decommissioning Safety Cases (section 8); and
- Publication of Approved Safety Cases by petroleum undertakings (section 9).

1.4.2 Interpretation

Where the word 'will', 'shall', 'must' or 'should' is used in these Guidelines, it describes the information that is needed in the safety case, but the petroleum undertaking generally has to decide how to present this information.

For ease of interpretation, the CER has summarised certain provisions of the Act in these Guidelines. Such summaries are provided for convenience only and are not a substitute for reading the Act and shall not relieve any petroleum undertaking from any obligation under the Act or operate as a defence to any failure to comply with its obligations under the Act.

In accordance with section 13B of the Act, nothing in the Act or within these Guidelines shall be read as to be restrictive of any other duty, requirement or obligation imposed by law in respect of safety which would otherwise apply to a petroleum undertaking.

The examples provided in the example boxes are illustrative only and are included to aid understanding and are not prescriptive or exhaustive. They do however represent the CER's understanding in relation to the subject matter of the example.

1.5 *Related Documents*

These Guidelines form part of the Framework. Within the Framework, there are a number of written regulatory documents and regulations, which are referred to in these Guidelines to provide additional guidance and context, and these include:

- *Safety Permit Application Guidelines:*
The *Safety Permit Application Guidelines* set out the CER's assessment process, including timescales, for safety cases submitted by petroleum undertakings.
- *ALARP Guidance*
The *ALARP Guidance* document provides guidance to petroleum undertakings on the requirements for demonstrating within a safety case that the risks to safety are ALARP.
- *Compliance Assurance System*
The *Compliance Assurance System* defines the way in which the CER monitors and enforces compliance by petroleum undertakings with their obligations under the Act. The *Compliance Assurance System* document is framed in two parts. The first part sets out the requirements upon petroleum undertakings to:
 - Implement a Verification Scheme using one or more Independent Competent Body(s);
 - Report on safety performance indicators to the CER each quarter; and
 - Conduct Independent Safety Case Reviews.

The second part sets out the system the CER will adopt to audit and inspect petroleum undertakings to determine compliance with the safety case and safety

permit and the requirements upon petroleum undertakings under the first part of the *Compliance Assurance System* document bulleted above.

These Guidelines require petroleum undertakings to demonstrate compliance with the requirements of relevant parts of the *Compliance Assurance System* document (in particular with respect to Verification).

2 Guidelines on the Preparation of All Safety Cases

This section provides guidance on the preparation of all safety cases. It specifically provides guidance on:

- Who Submits a Safety Case (section 2.1);
- Level of Information Provision within a Safety Case (section 2.2);
- Availability and Access to Records (section 2.3);
- Safety Case Structure (section 2.4); and
- Update of Approved Safety Cases (section 2.5).

2.1 Who submits a Safety Case?

Safety cases are required to be submitted by petroleum undertakings who are carrying out established petroleum activities, or who propose to carry on designated petroleum activities. A petroleum undertaking is any person to whom a petroleum authorisation has been given or granted.¹⁵

Petroleum authorisations include a petroleum exploration licence, a petroleum prospecting licence, a reserved area licence, a petroleum lease, a pipeline consent issued pursuant to section 40 of the Gas Act 1976, as amended and a consent under section 5 under the Continental Shelf Act 1968, as amended. A single petroleum authorisation may be granted to more than one person. The Act imposes duties on each person to whom the petroleum authorisation is granted.¹⁶ Each person owes an individual duty to operate within the safety regime prescribed by Act and therefore each person to whom a petroleum authorisation is granted is required to submit a safety case in respect of designated petroleum activities proposed to be carried out under their petroleum authorisation.

The requirement that each named person to whom the petroleum authorisation is granted must submit a safety case raises practical safety and assessment issues if each named person were to submit a safety case in respect of the same petroleum activity. Therefore, the CER will consider on a case-by-case basis, and where appropriate agree, practical mechanisms proposed by petroleum undertakings in submitting safety cases. For example the CER may consider:

- a) All of the persons included on a petroleum authorisation each signing and submitting a single safety case; or
- b) A single safety case signed by a disclosed agent for and on behalf of each individual person named on the associated petroleum authorisation.

¹⁵ Section 13A of the Act.

¹⁶ Persons named on a petroleum authorisation will frequently be jointly and severally liable to the Minister under the terms of that petroleum authorisation. The allocation of liability under the petroleum authorisation should be distinguished from the allocation under the Act where each petroleum undertaking holds an individual duty for the safe undertaking of a given petroleum activity.

For the avoidance of doubt, whatever approach is agreed in no way relieves any of the persons named on the underlying petroleum authorisation from their responsibilities or liabilities under the Act.

2.2 Level of Information Provision within Safety Case

All safety cases prepared and submitted to the CER under the Act are required to be prepared in accordance with these Guidelines.¹⁷ In respect of a designated petroleum activity or activities, each safety case must *at least* contain such particulars as are specified in these Guidelines as relating to that activity.¹⁸

Although these Guidelines provide guidance on the appropriate contents of safety case(s), they do not give absolute instructions on the information required for every safety case as each combination of designated petroleum activity or activities, petroleum infrastructure and location is unique. It is the responsibility of the petroleum undertaking to provide a well-structured and coherent safety case which demonstrates that the petroleum undertaking is capable of implementing the SMS described in the safety case, of carrying on petroleum activities in compliance with the General Duty and which provides sufficient information to allow judgement by the CER of whether the safety case complies with the Act and is consistent with the Guidelines.

Petroleum undertakings need to provide sufficient information so that the safety case can be understood and assessed in the appropriate context. Data sources should be referenced, or their source identified in the safety case. The level of information provided should be appropriate, which will vary according to the lifecycle stage; excessive detail may serve to unintentionally obscure the argument for safety within a safety case.

2.3 Availability and Access to Records

The safety case is expected to make reference to detailed calculations, assessments, procedures, or similar. All information referenced within a safety case must be retained by the petroleum undertaking and must be made available to the CER if required.

Without prejudice to this, where there is a specific requirement for a particular type of record to be retained by the petroleum undertaking, this is identified in these Guidelines.

2.4 Safety Case Structure

The structure and outline contents for each of type of safety case is set out in sections 4 to 8 of these Guidelines. The structure set out in each of those sections is suggested as an appropriate structure for each respective type of safety case. A petroleum undertaking is not bound to follow this structure, but must supply all of the information identified.

¹⁷ Section 13M of the Act.

¹⁸ Section 13M(4) of the Act.

2.5 **Update of an Approved Safety Case**

The safety case is a working document that must be maintained up-to-date by the petroleum undertaking such that all parts of it accurately reflect the actual conditions in carrying out designated petroleum activities under a safety permit. Where a proposed alteration to the manner in which a designated petroleum activity is carried on is a 'material change', the petroleum undertaking cannot make that alteration until a safety case with the proposed alteration has been submitted and approved by the CER and the relevant safety permit reissued.

Material changes to safety cases will be assessed by the CER in accordance with its *Safety Permit Application Guidelines*.

2.5.1 **Material Change Guidance**

This section provides guidance on what constitutes a material change. However, it is the responsibility of the petroleum undertaking to form a judgement as to whether a proposed alteration to an activity that is the subject of an approved safety case is material or not.

A change will be material if it affects the basis of an approved safety case in relation to the operation, design, management, risk, required risk reduction measures or other matter in respect of the designated petroleum activity to which the safety case refers. A material change may occur at any time in the lifecycle of petroleum infrastructure or designated petroleum activity. Changes that are considered to be material for a Design Safety Case or a Production Safety Case include, but are not limited to:

- The maximum number of stated persons on board in the safety case increases;
- The minimum number of persons required to carry on the designated petroleum activity decreases;
- A new jacket is added to an offshore installation;
- A new hydrocarbon pipeline enters or exits an onshore Facility;
- A new hydrocarbon riser enters or exits an offshore Facility;
- The route of a pipeline changes outside of a previously defined pipeline corridor;
- The operating pressure of a pipeline exceeds the pressure originally notified;
- A different hazardous fluid is transported by a pipeline;
- A new hazard is introduced or has been identified;
- A new Safety Critical Element is required or one is removed;
- A new or altered well on an existing site that enters a previously unexploited reservoir;
- There is a change in well use;¹⁹
- Changes to well or formation connection by fracture stimulation;
- Changes in material specification for well components; and
- There is a change to the method of petroleum lift.

¹⁹ For example, change of status between producing, water injection, or being suspended or abandoned.

As described later in section 5.2, a Well Work Safety Case describes the safe envelope within which a well is designed and drilled. This means that design, or drilling changes made in the course of the Well Work Activity that stay within this envelope are not material changes. A change that is outwith that described in the Well Work Safety Case and affects the basis of an approved safety case is considered to be a material change and these include, but are not limited to such changes to the:

- Surface location;
- Target location;
- Pore or fracture pressure gradients;
- Reservoir fluid composition;
- Well trajectory;
- Casing Scheme; and
- Drilling plan such as to include coiled tube drilling where this had previously not been included in the safety case.

The petroleum undertaking should ensure that the total impact of non-material changes is monitored so that if a number of non-material changes are proposed and the sum of these is material, the safety case is resubmitted to the CER before this occurs. This requirement is to specifically avoid a material change being made in a piecemeal fashion.

2.5.2 Performance Standard and Design Verification Requirements

A material change is subject to design verification as per a new well or installation as appropriate. The Verification Scheme itself may then be updated accordingly with the requirement for the ICB to review the changes as they would a new Verification Scheme. This also applies to a material change described in an addendum to the safety case (section 2.5.4). For a material change that can be covered by an addendum, the Verification Scheme may also be temporarily revised by the addendum.

Example

For a material change that involves a flotel working in conjunction with a Production Installation, the material change must be subject to design verification and so, since the flotel is likely to have already been built, the petroleum undertaking will have to demonstrate that the flotel has been subject to a process that achieves the same outcomes as the verification process described here.

The performance standards relating to the design, and construction of the material change are expected to be within, or updates to the existing performance standards rather than standalone documents that may not align with the existing performance standards.

The performance standards themselves are required to be referenced in a safety case and a change to them may constitute a material change. In this case the ICB will need to review the impact on the Verification Scheme, as per section 2 of the *Compliance Assurance System* document.

2.5.3 Requirement for a New Design Safety Case

For a material change to a Production Safety Case, a new Design Safety Case will be required to be submitted before the revised Production Safety Case, unless explicitly exempted by the CER. Such exemptions will be in limited circumstances, where the risk implications are relatively low. The new Design Safety Case will only need to cover parts of the designated petroleum activity that are affected by the material change. It is not a document that is maintained over the lifetime of the installation and is only concerned with the proposed material change.

For a material change to a Non-production Safety Case, only a revised Non-production Safety Case is required.

2.5.4 Addendum to a Safety Case

In certain circumstances, and only with the prior agreement of the CER, certain material changes to a safety case may be handled by these changes being identified and submitted in an addendum to the safety case. This addendum will be valid for a defined period of time, and explains the impact of the material change and how the risks are maintained ALARP in this period. The format and guidance for the addendum is the same as for the full safety case, but with the scope only covering the changes and their impact on the risk of the affected designated petroleum activities and a clear statement of the period for which the addendum is valid.

Such an addendum would be appropriate if the change described in the addendum was temporary in nature such that once the defined period of time for the addendum lapsed, the safety case remains appropriate to the petroleum activities and associated petroleum infrastructure.

Example

If a Non-production Installation (drill rig) and a Production Installation operate together for the purpose of drilling an additional platform well into an existing reservoir, the additional well may not be a material change to the platform (provided the hazards are the same as the existing wells). Notwithstanding the fact that a Well Work Safety Case has to be submitted and approved for the well being drilled, the Production Safety Case only changes slightly (by virtue of an additional well). Therefore, the temporary material change that is the combined operation (drilling over a production facility), can be described in an addendum to the Production Safety Case (with reference to the Non-production Safety Case). The following points should be considered in a Production Safety Case addendum for a combined operation with a drill rig:

- Extra or altered plant or equipment needs to be described.
- New or altered hazardous substances, increased risks or SCEs introduced as part of the combined operation need to be described.
- A joint review of the safety aspects of the combined operation should be carried out with all significant parties involved, in which the identification of MAHs and the assessment of risks which may arise are assessed.
- The safety case must show that the combined operation is suitably managed between the Non-production and Production Installations and that where the Safety Management Systems interact, or overlap, it provides clarity with regard to the procedures that are in place and the roles of individuals. In particular, the procedures and processes for communications between the two parties should be highlighted. A bridging document must be referenced and summarised in the safety case.
- Any additional or altered tasks, roles and responsibilities of the installation manager and staff need to be described for normal operations and emergency response.
- The managerial person identified with overall authority and responsibility in the event of an incident should be identified.
- Any changes to emergency response plans, procedures and exercises should be described.

3 Prescriptive Requirements

The Act prescribes and the Framework implements a goal-setting safety case regime. However within this goal setting safety case regime, prescriptive requirements can be made where:

- The hazards are well understood and there are established protective or preventive measures adopted in the industry;
- Cost benefit analysis would not necessarily support the adoption of Good Practice; or
- The CER recognises some advantage in having a common approach.

This section sets out prescriptive requirements and safety cases must demonstrate compliance with these prescriptive requirements where relevant to their petroleum activity.

This Act also allows for standards identified by National Standards Authority of Ireland to be included with the Framework and these are identified in section 3.4.

3.1 *Prevention*

Safety cases, which include offshore, above sea surface petroleum infrastructure, must describe how the following requirements are achieved:

- Offshore helicopter landing areas must comply with relevant national and international guidelines;²⁰
- Aids to navigation for offshore installations must comply with relevant national and international guidelines; and
- All above sea surface offshore petroleum infrastructure must have AIS complying with relevant national and international requirements.

3.2 *Control and Detection*

The safety case must describe how the following requirements are achieved with regard to control and detection of Major Accident Hazard:

- Petroleum infrastructure shall have suitable means to detect hazards and then achieve a safe condition, if necessary, by shutting down;
- For petroleum infrastructure where a release of a substance can give rise to gas or vapour with the potential for a Major Accident Hazard, an appropriate detection system shall be installed to detect that hazard and initiate a suitable response;
- For petroleum infrastructure where a fire could occur with the potential to create a Major Accident Hazard, an appropriate detection system shall be installed to detect the fire and initiate a suitable response;
- All hydrocarbon risers on offshore Facilities, shall have a remotely operated topside fail-safe isolation valve located at the lowest practicable point on the riser that allows safe access for testing and maintenance, has a minimum of pipework and potential

²⁰ The specific requirements of the Irish Coast Guard are relevant here.

leak points outboard of this valve and is protected from fire and explosion as far as is reasonably practicable;

- All pipelines that contain or may contain hydrocarbons crossing the boundary fence of an onshore Facility shall have a remotely operated fail-safe isolation valve suitably located; and
- All Facilities shall have appropriate emergency power such that loss of the normal power supply does not impair the ability to manage Major Accident Hazards.

3.3 Emergency Response

The safety case must describe how the following requirements are achieved:

- Appropriate means of alerting persons to an emergency;
- Multiple communication channels with any external body whose assistance is required to manage the emergency;
- For an offshore Facility, totally enclosed motor propelled survival craft (TEMPSC) for at least the maximum number of persons onboard to allow a means of evacuation;
- For an offshore Facility, sufficient liferaft capacity for at least the maximum POB;
- Provision to allow persons to safely muster in an emergency;
- Adequate communication between muster points on a Facility;
- Multiple escape routes to muster points from all normally manned areas of petroleum infrastructure;
- For an offshore Facility, multiple escape routes from muster points to embarkation points;
- For an onshore Facility, an escape route from each muster point to a safe boundary exit point;
- On an offshore Facility, a safe refuge with adequate protection to allow persons to muster, assess the emergency situation, communicate within the Facility and to external bodies, control the emergency as far as possible and manage an appropriate response; and
- Suitable personal protection equipment in appropriate locations for the hazardous conditions that may be encountered in an emergency situation.

3.4 Standards

Section 13L(3)(c) of the Act provides that the Safety Case Guidelines may include

the standards and codes of practice applicable to designated petroleum activities including relevant standards and codes of practice, that have been formulated or recommended by the National Standards Authority of Ireland

The National Standards Authority of Ireland has formulated a list of relevant standards and codes of practices that are applicable to designated petroleum activities. The document is located on the CER website and is:

NSAI Petroleum Exploration and Extraction Technical Standards Committee recommended standards selection policy, Issue date: 2013-09-09

4 Requirements for Production Safety Cases

Section 4.1 provides guidance on the scope of a Production Safety Case.

Sections 4.2 to 4.7 provide the structure and outline contents for a Production Safety Case. Demonstration of the adherence to the prescriptive requirements set out in section 3 must be addressed where relevant within the Production Safety Case.

4.1 *Scope of a Production Safety Case*

To carry on a production activity, the petroleum undertaking must hold a Production Safety Permit for that specific production activity which will be issued pursuant to an approved Production Safety Case and, in respect of new production activities (or production activities which involve a material change)²¹ a corresponding approved Design Safety Case.

A Production Safety Case must demonstrate that the safety arrangements for a designated production activity ensure that the risk associated with the activity remains ALARP.

The Production Safety Case should include a generic description of any Well Work Activity that is capable of being carried out from a Production Installation. For example, BOP arrangements should be described in the Production Safety Case. However when the Well Work Activity is carried out that requires the BOP, a Well Work Safety Case must be submitted and would need to show that the BOP arrangement was appropriate for the well.

A Production Safety Case must cover the entire range of production activities which a petroleum undertaking has been authorised to carry on pursuant to its Petroleum Lease and associated Plan of Development. In principle, this would all be contained in a single document. As set out below however, the CER may require that separate safety cases are submitted in respect of different parts of the petroleum infrastructure in order to facilitate assessment.

Where a petroleum undertaking is proposing to carry on a production activity where there is no above surface infrastructure offshore, but there are subsea wells controlled from an onshore Facility, a single Production Safety Case, covering the entirety of that petroleum activity and associated petroleum infrastructure can be submitted. To ensure that all risks relevant to the proposed production activity are addressed, the Production Safety Case in this instance must cover all petroleum infrastructure within the boundary fence of the onshore Facility within its scope (regardless of whether the petroleum infrastructure is necessary to carry on the specific production activity which is the subject to the safety case application). In this scenario any offshore pipelines would also be included in the Production Safety Case.

²¹ Where a petroleum undertaking has had a plan of development submitted pursuant to a petroleum lease approved by the Minister prior to the publication of these Guidelines, the petroleum undertaking shall not be required to submit a Design Safety Case in the first instance.

Where a petroleum undertaking is proposing to carry on a production activity where there is above surface petroleum infrastructure offshore and subsea wells controlled from that offshore infrastructure, a single Production Safety Case, covering the entirety of that offshore petroleum infrastructure and operations can be submitted. To ensure that all the risks relevant to the proposed production activity are addressed, the Production Safety Case must cover all petroleum infrastructure related to that production activity as well as any other petroleum infrastructure that could have a bearing on the hazards in carrying out the production activity, or is controlled from that location (for example all subsea tiebacks and pipelines) regardless of whether that petroleum infrastructure is necessary to carry on the specific production activity which is the subject to the safety case application.

Where a petroleum undertaking is proposing to carry on a production activity which involves a manned offshore Facility and a manned onshore Facility, two separate Production Safety Cases should be submitted: one related to the manned offshore Facility (the 'offshore' Production Safety Case) and one related to the manned onshore Facility (the 'onshore' Production Safety Case). This is appropriate as each Facility presents a different risk profile to workers and members of the public and it would be too cumbersome to have a single Production Safety Case in such a scenario. The 'offshore' Production Safety Case will be required to cover the petroleum infrastructure related to the production activity from the wells through to a suitable point, such as the beach or pipeline landing valve on the shore. To ensure that all the risks relevant to the proposed production activity are addressed, the 'offshore' and 'onshore' Production Safety Cases must cover all petroleum infrastructure related to that production activity as well as any other petroleum infrastructure that could have a bearing on the hazards in carrying out the production activity, or is controlled from that location (for example all subsea tiebacks and pipelines, or all petroleum infrastructure within the boundary fence) regardless of whether that petroleum infrastructure is necessary to carry on the specific production activity which is the subject to the safety case application. The 'onshore' Production Safety Case will be required to cover all petroleum infrastructure from where the scope of the offshore Production Safety Case ends to and including the onshore Facility (included associated pipelines). Both offshore and onshore Production Safety Cases must be approved by the CER before the associated Production Safety Permit will be issued.

Where a single piece of petroleum infrastructure is used by more than one petroleum undertaking in respect of petroleum activities carried out pursuant to more than one petroleum authorisation (e.g. a new subsea tieback from a well to an existing offshore installation, such that the offshore installation is used by the original development and the new subsea tieback), safety considerations render it necessary that only one SMS should apply to that piece of petroleum infrastructure. However, in this case, each petroleum undertaking utilising the petroleum infrastructure will be obliged to discharge its obligations under the Act, and so to ensure all risks in respect of that petroleum infrastructure are reduced to a level that is ALARP. In order to demonstrate this, each submitted Production Safety Case must cover all activities and petroleum infrastructure required to carry on the designated petroleum activity. However, where appropriate on a case by case basis, the Production Safety Case of either petroleum undertaking may refer to and **adopt** the

Production Safety Case of the other petroleum undertaking insofar as it relates to the production activities carried on by the shared petroleum infrastructure (the adopted safety case). In this case, what is covered in each Production Safety Case must be clearly delineated (e.g. for the new subsea tieback, its safety case could, in principle, refer and adopt the entire updated offshore Production Safety Case).

The rationale for such an approach is to avoid a situation where the management of risks at the same piece of petroleum infrastructure is subject to multiple Safety Management Systems, thereby creating the potential for misunderstanding and contradiction. For the avoidance of doubt however, in adopting the relevant portion of the third party Production Safety Case, the petroleum undertaking is indicating that the 'adopted' safety case discharges its obligations under the Act. The adoption of a third party safety case in no way mitigates or reduces the liability of the petroleum undertaking for the safe operation of the petroleum infrastructure at issue or otherwise releases the petroleum undertaking from its obligations under the Act. The 'adopted' safety case is for all purposes considered part of the petroleum undertaking's safety case.

4.2 Safety Case Purpose and Context

4.2.1 Petroleum Authorisation and Petroleum Undertaking

The safety case will detail:

- The petroleum authorisation to which the safety case refers;
- The petroleum undertaking(s) that is submitting the safety case; and
- A postal address in the Republic of Ireland at which records referred to in section 2.3 are kept and made available to the CER.

4.2.2 Designated Petroleum Activity

The safety case must give an outline description of the designated petroleum activities being carried out detailing:

- the location and nature of the petroleum infrastructure to be used in the carrying on of the designated petroleum activity;
- the nature of the surroundings; and
- connected, or related petroleum infrastructure.

4.2.3 Reason for Submission

The reason why the safety case is being submitted including whether it is submitted for the first time, is an update of a previous safety case, or replaces another safety case.

If the safety case is being submitted as a consequence of a material change in relation to a petroleum activity that is the subject of an approved safety case, a summary of the material change will be provided.

4.2.4 Associated Safety Cases

The safety case will describe the purpose and scope of all other safety cases referenced within the Production Safety Case.

4.2.5 Roles and Identities of Third Party Organisations

The roles, identity and safety-related relationship of any third party organisations²² that have a critical bearing on the management of Major Accident Hazards (and including those operating their own Safety Management Systems) shall be summarised. As a minimum, details will be required for organisations carrying on the following in respect of the designated petroleum activity:

- Design and construction of changes to petroleum infrastructure;
- Integrity management, or assurance services in respect of petroleum infrastructure;
- Drilling and well services; and
- Operational support where the third party's day to day operations are not under immediate control of the petroleum undertaking.

The safety case must identify third parties whose co-operation may be required in an emergency situation, or to prevent an emergency situation, who are not under the control of the petroleum undertaking.

In addition, the safety case will outline arrangements for the petroleum undertaking or its workforce to cooperate with a third party in respect of an emergency arising in respect of a petroleum activity being carried on by that third party. These arrangements must be demonstrated in this safety case.

Example

If two offshore platforms carrying out production for two different petroleum undertakings are connected by a pipeline such that one exports to the other, the importing platform would need the exporting platform to cease export in the event of an emergency. This may be achieved by diverse automatic and manual communication means and these should be identified here and described in later sections of the safety case.

4.2.6 Safety Case Structure Alignment with Guidelines

The safety case will show how its structure aligns with these Guidelines.

²² Legal entities must be specified.

4.3 Petroleum Infrastructure Description

4.3.1 Position and Layout

For a pipeline, suitable descriptions and appropriate diagrams will be provided, together with a map defining the start, end and route of the pipeline and including proximity to population, topography, locations of valves and points of interconnection with other pipelines or petroleum infrastructure.

For a Facility, diagrams will be provided to show the:

- Location and orientation of the Facility (for offshore installations this should be on an admiralty large scale nautical chart of the area in question with positions in latitude and longitude using WGS 84 datum);
- Location and purpose of any wells, including identification of water depth for subsea wells;
- Layout of the Facility's plant and key safety systems; and
- Location of other Facilities and pipelines that may have a bearing on the hazards presented by the Facility or their management.

For onshore Facilities, the surroundings that could be affected by a hazard from the designated activity will be described with sufficient detail to allow the assessment of the hazards created and how they are affected by the choice of location. The location of nearby petroleum infrastructure will also be given if they have a bearing on the hazards.

4.3.2 Location Specific Conditions

The location specific conditions to which the petroleum infrastructure is exposed and designed for shall be described including (as relevant):

- Maximum wind conditions;
- Extreme temperature conditions (sea and air);
- Wind Rose and prevailing wind information where this has an impact on petroleum infrastructure layout;
- Extreme water current and wave conditions;
- Sea bed conditions relevant to jacket and anchoring requirements; and
- Relevant seismic information for the locality.

The Safety Case must demonstrate how location specific conditions that have an impact on operations are monitored, including those that may have a long-term affect such as fatigue of structures.

4.3.3 Hazardous Substances

The following information is required for hazardous substances with the potential to cause a Major Accident:

- The behaviour of the hazardous substances during Major Accidents, including those that could be formed from chemical changes during a Major Accident (e.g. combustion);

- The CAS number and name under IUPAC nomenclature for each hazardous substance; and
- Physical, chemical, toxicological characteristics and indication of the hazards to people, both immediate and delayed.

Diagrams will be provided to show the:

- Locations of the hazardous substances;
- Segregation and barriers employed to separate hazards from safe areas; and
- Routes of all pipelines and risers including those connected to other petroleum infrastructure and wells.

4.3.4 Reservoir and Well

4.3.4.1 Reservoir

The following information must be provided for the reservoir or reservoirs that the wells are located in:

- Formation geological and geophysical details;
- Basic reservoir data, including:
 - Pressure and temperature;
 - Formation petro-physical properties; and
 - Depth to reservoir tops and reservoir thicknesses;
- Reservoir fluid composition, and physical and chemical attributes of the reservoir fluids (including produced water):
 - A specific note should be made of the presence of H₂S and CO₂.

4.3.4.2 Well Description

The following must be described for each well, with suitable diagrams where appropriate:

- Well identification and top hole location (either specific point or defined area);
- Purpose of well (production, injection, etc);
- Depth references;
- List of offset wells that are relevant for this particular well;
- Maximum, operating and shut-in pressures and temperatures at the wellhead and bottom-hole;
- Overburden geological and geophysical data:
 - Geological setting;
 - Formation fluid pressure profile;
 - Formation fracture gradient profile including known or anticipated reservoir fluid contacts;
- Well construction data:
 - Well trajectory;
 - Wellbore fluids;
 - Casing and completion designs, including schematics specifying components, barriers, locations and depths;
 - Pumping designs and other aids to production, such as gas-lift;
 - Wellhead type and configuration (including specific reference to the suitability for the pressure and temperature conditions);

- Xmas tree type and configuration (including specific reference to the suitability for the pressure and temperature conditions);
- Material specification, including elastomers;
- Monitoring:
 - Pressure and temperature measurement location and frequency; and
 - Erosion assessment and mitigation.

4.3.5 Petroleum Infrastructure Connected to the Facility

A description of any petroleum infrastructure to which the Facility is connected is required. The physical and organisational arrangements for safely managing the interfaces between the Facility and connected infrastructure (for example, pipelines) will be described with cross reference to the SMS if needed.

4.3.6 Persons Affected

The location and numbers of persons whose safety may be at risk from the petroleum infrastructure will be identified including workers associated with the petroleum infrastructure and members of the general public.

For onshore sites the location and numbers of the local population should be shown on a map.

4.3.7 Operations

The safety case will describe all designated petroleum activities, petroleum infrastructure and all activities that may have an impact on the safety of persons, especially those that have the potential to cause a Major Accident including at least:

- Activities relating directly to the processing of petroleum. To describe the hydrocarbon processing, a process flow diagram will be provided showing at least hydrocarbon isolation and blowdown valves;
- Utility systems that are needed to support these operations will also be described;
- Personnel transportation (helicopter, marine access, onshore vehicle control);
- Personnel welfare (accommodation, medical, catering, HVAC);
- Logistics (supply boats, offloading, laydown, Facility loading);
- Any diving operations carried out from the relevant petroleum infrastructure;
- Marine operations that may safely be performed including the means of ensuring that marine and other operations, do not conflict in an unsafe manner; and
- For a floating Installation, the means of ensuring that it safely remains in position in the stated weather window for operations will be given.

The full range of maintenance and service activities need not be described in this section. These will be managed through the SMS.

4.3.8 Well Operations

4.3.8.1 Normal Well Operations

Normal well operations are those designated petroleum activities that can be carried on pursuant to Production Safety Permit and which do not require a Well Work Safety Permit

The Production Safety Case must clearly identify and describe normal well operations to be carried out. Once the Production Safety Permit is issued, these operations can be carried out in accordance with the Production Safety Case and Production Safety Permit, without further submission of safety cases to the CER.

4.3.8.2 Well Work

If the Production Installation can carry out well work activities, then this should be described in the Production Safety Case in such a way that it covers all well work activities that are capable of being carried out from that Production Installation (otherwise a material change of the Production Safety Case will be needed before such well work activities could be undertaken). The safety case requirements are as given in section 6.3.4 for Non-production Installations.

If such well work activities are planned, a Well Work Safety Case would have to be submitted and demonstrate that the Production Installation's well work equipment is capable of safely carrying out the operation.

4.3.8.3 Suspension and Abandonment

The safety case must provide a summary of the proposed method for well plugging by cement, and not solely mechanical means, carried out for the purposes of suspension or abandonment. The safety case should demonstrate that the well can be plugged in this way:

- In a safe manner; and
- In such a way to ensure that as far as is reasonably practicable there can be no unplanned escape of fluids from the well.

4.4 ALARP Demonstration

The safety case must demonstrate how the petroleum undertaking will reduce risks associated with its petroleum activities to a level that is ALARP. To do this, the *ALARP Guidance* document must be followed and sections 4.4.1 to 4.4.7 gives guidance on how such an ALARP demonstration should be presented within the safety case.

The ALARP demonstration should cover the designated petroleum activities, as well as demonstrating that the General Duty is being discharged by the petroleum undertaking.

4.4.1 Methodology

The safety case must describe the methodology used to demonstrate that the risks associated with the activities of a petroleum undertaking are reduced to a level that is

ALARP in accordance with section 4.1 of *ALARP Guidance* document. It must contain details of the following:

- Hazard and Risk Reduction Measure Identification (section 4.4.2);
- Good Practice (section 4.4.3);
- Assessment of Risk against Risk Tolerability Limits (section 4.4.4);
- Quantitative Risk Assessment (section 4.4.5); and
- ALARP Assessment (section 4.4.6).

4.4.2 Hazard and Risk Reduction Measure Identification

A comprehensive hazard and risk reduction identification process and its results must be demonstrated in the safety case. The petroleum undertaking must demonstrate that they have carried out a comprehensive identification of hazards that could have an immediate or long term safety impact to people. This must be in sufficient detail to fully understand the nature of each hazard and to identify the most appropriate risk reduction measures necessary for hazard management. The assessment must cover all human factors, infrastructure, plant and equipment that could cause or contribute to an accident, including subsea systems, pipework, process plant and plant areas and utilities. Major Accident Hazards should be specifically identified. If the decision is made to implement a risk reduction measure as opposed to not implementing it, the justification does not need to be included in the ALARP demonstration as the critical decisions are those where a risk reduction measure is not implemented.

4.4.3 Good Practice

Meeting Good Practice or its equivalent, where this is defined, is the first requirement which must be adopted in order to demonstrate that the risk has been reduced to a level that is ALARP. The safety case must give an overview of how this is achieved in operations and design (referring to the SMS if required). A list of standards that represent Good Practice in Ireland is given in section 3.4. As outlined in the *ALARP Guidance* document, Good Practice changes with time and so there is a need for the petroleum undertaking to assess on an on-going basis whether an improvement in Good Practice leads to any safety critical deficiencies between the existing situation and the updated Good Practice. The safety case should demonstrate how this process is undertaken and how it assures any safety critical deficiencies are resolved.

4.4.4 Assessment of Risk Against Risk Tolerability Limits

For activities that have the potential to give rise to a Major Accident Hazard, the individual risk and the societal risk (in each case as described in the *ALARP Guidance* document must be compared to the risk tolerability limits to determine whether the risk is intolerable, broadly tolerable, or tolerable if ALARP. Quantitative risk assessment must be used to make this comparison. The risk assessment itself must be described in the safety case and the requirements for this and further guidance is given below.

4.4.5 Quantitative Risk Assessment

4.4.5.1 Overview

A quantitative risk assessment (QRA) is required in the safety case in order to determine the cumulative risk, compare against tolerability criteria and identify what drives that risk so that the hazards can be managed.

The QRA should demonstrate that the likelihood and the consequences of each Major Accident Hazard have been assessed in a systematic manner. The methodology and the results of the QRA will be documented in the safety case and should include:

- Methods and assumptions used;
- Failure rate data used, which must be relevant to the application and composed of a dataset for which there is sufficient certainty in its accuracy; and
- Justification for data in terms of:
 - Site-specific circumstances;
 - Processes and methods used to assess the consequences of each event; and
 - Sensitivity of the conclusions to the assumptions made and the inherent uncertainty in the data inputs and the modelling used.

For any hazard that may occur, there are likely to be a large number of possible outcomes dependent on, for example, whether emergency systems respond as intended or not, the location of an accidental hydrocarbon release and its size. The QRA should contain sufficient detail such that these variations can be considered as part of the analysis and:

- Improve understanding of the hazards and what drives the risk from it;
- Show where risk reduction measures could be improved; and
- Identify whether the risk is tolerable or not.

A degree of conservatism relative to the level of uncertainty in the risk assessment and its inputs should be included to ensure that the risk assessment results are robust.

4.4.5.2 Frequency Assessment

The frequency assessment needs to assign a frequency to each of the events modelled in the consequence assessment (below) in a way that is robust and conservative and this needs to be demonstrated in the safety case.

Example

The frequency and consequence of a hydrocarbon release vary depending on the size of the leak and so a range of release sizes should be used in the QRA. Too few release sizes will result in inaccurate assessment and too many will be cumbersome and, in this instance, robust frequency data is unlikely to be available. For an offshore platform, this balance would be struck by using around four releases size, while for onshore pipelines, a minimum of two hole sizes is appropriate, of which one should be full bore rupture.

As described in section 4.4.5.1, if a range of events is modelled, the frequency of each event will be required to be calculated using an event tree technique or similar that takes into account the reliability of risk reduction measures such as fire and gas detection for loss of containment releases, ARPA for ship collision events, smokehoods and breathing apparatus, escape routes and, where appropriate, evacuation means such as lifeboats and life-rafts.

4.4.5.3 Consequence Assessment

For each hazardous event modelled in the assessment, the consequence modelling should assist the understanding of the hazard and Risk Reduction Measures and must include:

- A systematic process for assessing consequences taking into account, where appropriate:
 - Composition, size, location and duration of releases;
 - Weather conditions;
 - Influence of the equipment in the Facility and/or terrain on the hazards;
 - Worst-case and typical scenarios;
 - Control and mitigation measures such as emergency shutdown, blowdown, deluge;
- Realistic estimates of the severity and extent of each Major Accident Hazard, which may include calculation of:
 - Harmful doses of toxic gases;
 - Thermal fluxes and duration of exposure likely to harm persons or lead to escalation;
 - Explosion overpressures with effects on structure and persons; and
- Justification of all assumptions used.

The consequence models used in the analysis must take account of the current scientific knowledge about the hazards.

Where a hazard contributes a small proportion to the cumulative risk, or if a detailed QRA of the hazard is not required to demonstrate that the risk is ALARP, it can be modelled conservatively and in less detail.

4.4.5.4 Risk Assessment

The risk assessment combines the frequency and consequences of the hazardous event. A summary of the risk assessment must be included in the safety case and cover:

- Occupancy levels for buildings and areas;
- Harm criteria for different hazards; and
- POB distribution.

The risk assessment must show Individual Risk, Societal Risk in the form of an FN curve (if members of the public can be affected) and also location specific risks – the risk at a particular location independent of occupancy, or POB.

The safety case will show the comparison of the risk with the tolerability criteria defined in the *ALARP Guidance* document.

4.4.6 ALARP Assessment

As part of the overall hazard management process, SCEs must be identified and performance criteria defined for them such that the Residual Risk is reduced to a level that is ALARP. However, even if each chosen SCE is designed and operated such that the Residual Risk from failure of the SCE is ALARP, it may not mean that the overall risk associated with a designated petroleum activity is ALARP. As a consequence, as well as each SCE, each hazard and the achievement of inherent safety also needs to be considered and the demonstration requirements for this are given in section 4.4.6.2.

4.4.6.1 Safety Critical Elements

Each SCE reduces a particular part of the risk from a Major Accident Hazard, but not necessarily to zero depending on the availability, reliability, survivability and the actual functionality chosen for the SCE. Therefore, for each SCE, it should be demonstrated that the process by which its performance was chosen ensures that the risk is ALARP. This does not mean that the whole analysis needs to be described, but the process must be given in sufficient detail that it can demonstrate that it leads to a risk that is ALARP. Reference to more detailed studies or assessment should be provided. The *ALARP Guidance* document describes a number of ways in which it can be shown that a particular risk reduction measure reduces the risk to a level that is ALARP and the methods that are used to demonstrate this should be described here.

In most cases, semi-quantitative or quantitative risk assessment techniques should be used to determine the appropriate SCE performance as engineering judgement and qualitative risk assessment are unlikely to be accurate enough assessment tools to do this.

Example

Hydrocarbon containment is safety critical as a release of hydrocarbon has the potential to be a Major Accident Hazard. The hydrocarbon containment system (the SCE) is composed of valves, pipes, flanges, vessels etc that are rated to a certain pressure. The way in which this pressure is determined such that the risk of over-pressurisation is appropriately managed should be given in the safety case, but without necessarily the need for an exhaustive list of pressure ratings of the hydrocarbon containment system. If the inlet part of the process system is fully rated for the maximum pressure, this should be stated along with the justification for what the maximum pressure is. Other parts of the process plant may have a lower rating as they are protected by pressure safety valves and pressure instrumentation that causes the source of pressure to be isolated. The way in which this is appropriately designed and managed should be stated.

Example

The process used to define the rating and required location of passive fire protection should be described, but the location of each part of the passive fire protection does not necessarily need to be described.

4.4.6.2 Hazards and Inherent Safety

The ALARP assessment must demonstrate that the risk from each hazard is reduced to a level that is ALARP. This will involve the consideration of, amongst other things, inherent safety and risk reduction measures that are not in themselves SCEs including:

- Elimination and substitution of hazards;
- Overall concept (subsea wells, manned platforms etc);
- Inherent safety;
- Layout;
- Reduction of potential leak points;
- Location of the petroleum infrastructure;
- Distribution and number of persons; and
- Means of transportation.

Example

During the design process for an offshore platform, the need for an additional hydraulic power unit in a naturally ventilated module is identified. As part of the ALARP assessment it needs to be considered how the skid affects the natural ventilation and ensure that the risk from explosion and fire hazards are still ALARP with the change in ventilation. As the layout can be more readily changed during design, it is likely that ventilation considerations can be accommodated such that the additional risk is minimal and ALARP.

4.4.7 General Duty

The safety case should provide sufficient particulars to demonstrate that the petroleum undertaking is in compliance with its General Duty under the Act. In addition, the safety case will summarise and reference compliance with the safety obligations imposed/required by other statutory authorities and other relevant safety statutory requirements as part of the overall demonstration of compliance with the General Duty.

4.5 Safety Critical Elements, Performance Standards, Assurance and Verification

4.5.1 Introduction

The identification, design and operation of Safety Critical Elements are key to the management of Major Accident Hazards. As such the safety case must include a description of the process to:

- Identify Safety Critical Elements;
- Determine and document the required performance standard of SCEs to establish and maintain risks ALARP;
- Establish and execute inspection and maintenance processes to provide assurance to the petroleum undertaking that SCEs are meeting their performance standards; and
- Prepare, operate and maintain a Verification Scheme to provide an independent review of the above activities, as described in section 2.4. and 2.5 of the *Compliance Assurance System* document.

4.5.2 Safety Critical Elements

The safety case must demonstrate how SCEs have been identified, list them and describe their hazard management role. The description should focus on the way in which the hazard management role of the SCE is achieved rather than the detailed way in which it is implemented.

Example

All risk reduction measures should be considered as to whether they are SCEs, including, but not limited to the following in respect of mitigation: ventilation control systems, fire resistant coatings, fixed extinguishing systems, deluge systems, secondary containment, blastwalls and firewalls.

The standards to which a SCE is designed should be identified. A list of standards that represent Good Practice in Ireland is given in section 3.4.

4.5.3 Performance Standards

The performance standard for a SCE defines what is required of it to meet its hazard management role such that risks are reduced to a level that is ALARP. The performance standards must be clearly referenced in the safety case.

As far as possible, each performance standard must be expressed in quantitative terms such that initial and continued performance can be measured and assessed.

As a minimum, the performance standards, must define:

- **Functionality:** A statement of the performance required of the SCE to fulfil its role either as a passive or active system;
- **Availability:** A statement of the required availability of the SCE. Most safety systems will need to be available at all times;
- **Reliability:** For active systems there is always the possibility that the systems will not operate on demand. The minimum acceptable reliability to operate on demand must be provided for the system as a whole and, if relevant, all its components recognising that some reliability can be achieved by having redundant systems;
- **Survivability:** The required performance of the system following an emergency (if any); and
- **Interactions:** The identification of the dependency of the SCE on the operation of other SCEs.

The performance as defined by the first four parts above must be shown to be achieved initially by the design and construction of the SCE (termed initial suitability) and on an on-going basis during operations (termed continued suitability). The performance standards should include references as to how the design part of initial suitability is achieved (this will normally be by reference to a design document, or engineering assessment) and identify how continued suitability is achieved (normally by reference to assurance processes involving monitoring, inspection and maintenance).

The performance standards need not describe the actions to be taken when the failure of a SCE is identified (by whatever means), but this is one of the key processes at the heart of the SMS and so the process used to determine such action must be described.²³ An overview of the assurance process for SCEs (section 4.5.4) and a summary of the process by which the design element of initial suitability has been achieved must be given (this is the same requirement as to show that the residual risk related to each SCE is ALARP –section 4.4.6.1).

Reliability targets are required in performance standards for components of active systems where their reliability can be measured with sufficient certainty (such that corrective action can confidently be taken if the reliability target is not met). Therefore, reliability targets must be provided in the performance standards for at least the following systems:

- Flammable and toxic gas detectors;
- Fire and smoke detectors;
- Emergency shutdown valves and blowdown valves;
- Safety critical process instrumentation and pressure safety valves;
- Firewater and gaseous extinguishment systems (to start);
- TEMPSC (launch and engine start systems); and
- HVAC (dampers to close and fans to stop).

Example

Emergency lighting could be expected to have very high reliability, but each individual light may have a much lower reliability with the overall lighting level target still being achieved and so a target reliability for each light is generally not required.

Prescriptive requirements outlined in section 3 should be addressed in this section where necessary.

4.5.4 Assurance

For each SCE, the process that ensures its continued suitability through assurance must be summarised.

The assurance process must entail active testing of the full functionality of each active SCE on a time interval that ensures that the risk from failure is ALARP. The process by which this interval is defined must be summarised. The assurance processes should ensure that all potential failure modes of the SCE are tested.

Similar processes must be described for each passive SCE and although testing is not usually required, the process by which the inspection of passive components (for example passive fire protection, hydrocarbon containment), especially to countenance ageing, is achieved will be demonstrated.

²³ Often referred to as operational risk assessments.

4.5.5 Verification

Verification is carried out for a petroleum undertaking by an ICB and is in addition to the petroleum undertaking's assurance activities. The safety case must reference the petroleum undertaking's Verification Scheme and it must comply with the requirements of sections 2.2.1 and 2.4 of the *Compliance Assurance System* document.

4.5.6 Well Verification

Well Verification is carried out for a petroleum undertaking by an ICB and is in addition to the petroleum undertaking's assurance activities.

For any Well Work Activity undertaken from the Production Installation, Safety Critical Elements will include equipment required for well control such as:

- The BOP;
- Pumps; and
- Choke and kill manifolds and associated lines and chokes.

The Well Verification Scheme must be referenced in the safety case and meet the requirements in sections 2.2.1 and 2.5 of the *Compliance Assurance System* document.

The safety case must document the completion of design and construction verification.

4.6 Safety Management System

4.6.1 Introduction

The Safety Management System (SMS) is the framework of policies, processes and procedures that are required to enable the petroleum undertaking to manage its safety risks and continually improve its safety performance with respect to the petroleum activities carried on or proposed to be carried on under a safety case. Rather than giving detailed specifications for the design of an SMS, this section provides guidance on the description of the SMS expected in a safety case.

The petroleum undertaking may adopt any suitable SMS that meets its operational needs; however it must meet the objectives of the methodology described in this guidance, which is known as Plan Do Check Act (PDCA) that has been adapted from OHSAS 18001.

PDCA is summarised as follows:

- **Plan:** Set a clear safety policy and establish the processes necessary to deliver results in accordance with the policy (for example by setting targets and objectives, identifying hazards, assessing risks and establishing standards against which performance can be measured);
- **Do:** Organise persons to manage safety and implement the processes;
- **Check:** Monitor and measure the processes against the safety policy and procedures and report the results, including periodic audit and review; and

- **Act:** Take action to continually improve safety performance and learn the lessons from experience and from the results of assurance activities within the petroleum undertaking's company, other companies and the oil and gas industry as a whole.

The description of the SMS within the safety case should provide evidence that the SMS satisfies these requirements, however it is not intended that it need include a detailed description of the entire SMS. The safety case will describe the major aspects of the SMS and should include at least:

- The safety policy;
- Hazard identification and risk assessment procedures;
- Roles and responsibilities of key persons with safety responsibilities;
- Methods used to ensure competence, training and awareness of persons;
- Procedures for communication and involvement of the workforce on safety matters;
- Documentation and control procedures:
 - Records of assurance activities are kept;
 - Reliability is measured; and
 - The process is reviewed to ensure on-going improvement;
- Safe control of operations, including permit to work and management of change procedures;
- Inspection, testing, maintenance and repair procedures;
- Emergency preparedness and response procedures; and
- Lessons are learnt from within the petroleum undertaking, other companies and the oil and gas industry as a whole.

The SMS must cover all persons involved in the petroleum activity including those that are listed under section 4.2.5 of these Guidelines, ensuring that any interfaces between different company's systems are appropriately described and managed.

4.6.2 Policy

An effective safety management policy will set a clear direction for the petroleum undertaking to follow. The policy will be defined and authorised by the senior management of the petroleum undertaking and will:

- Show clear safety leadership and commitment to a good safety culture;
- Include a commitment to the prevention of injury and continual improvement in safety management;
- Provide the framework for setting and reviewing safety objectives, include leading and lagging performance indicators;
- Be communicated to all persons working under the control of the petroleum undertaking with the intent that they are made aware of their individual safety obligations;
- Be reviewed periodically to ensure that it remains relevant and appropriate to the petroleum undertaking's activities; and
- Include third parties where they have an impact on the hazard management process.

4.6.3 Planning

4.6.3.1 General Requirements

The safety case must demonstrate that there is a planned and systematic approach to implementing the safety policy through a suitable SMS in order to reduce and maintain all risks at a level that is ALARP.

The planning activities during the design, operation and decommissioning stages of the lifecycle of petroleum infrastructure and associated petroleum activity, including risk assessment and the risk reduction measures installed, maintained, assured and verified are described in detail elsewhere in these Guidelines. The SMS must include processes and procedures for managing and documenting these activities and a description of them should be included in the safety case to demonstrate this is the case.

4.6.3.2 Risk Assessment

The safety case should demonstrate how the petroleum undertaking has established, implemented and maintained procedures for on-going hazard identification, risk assessment and the determination of necessary barriers to maintain the risk from all hazards at a level that is ALARP. Further guidance is provided in section 4.4.

The safety case should demonstrate how, as part of the SMS, the results of the identification of hazards, risk assessments and risk reduction measures are documented and kept up-to-date.

4.6.3.3 Human Factors

Human factors can be described as the way individual, job and organisational factors combine to potentially influence behaviour at work in a way that could impact on safety. Human factors should be integrated into many aspects of the SMS, not just risk assessment, including but not limited to:

- Management of change;
- Design and procurement of systems, equipment and machinery;
- Job and activity design such that the potential for human failure to lead to a major hazard is suitably minimised;
- Training of workers;
- Safety reporting and data analysis; and
- Incident investigation.

In considering the above areas that require human factors to be considered the following stages should be considered:

- Identify potential human failures that may occur with hazardous consequences (e.g. a lapse of attention, a slip of the finger, a misunderstanding, or even a deliberate violation of a procedure);
- Identify performance influencing factors that make human failure more or less likely to occur (e.g. inadequate manning, job factors such as inadequate procedures or

system/equipment interface, individual factors such as fatigue and motivation or organisational factors such as safety culture and work pressures); and

- Engage the workforce in carrying out the assessment and ask for their suggestions about risk reduction measures to prevent or reduce the human failures identified.

The safety case will demonstrate how this is achieved within the SMS and how the assessment has been undertaken for the relevant activities.

4.6.3.4 *Management of Change*

The safety case must demonstrate that there is a process by which the petroleum undertaking identifies the hazards and risks associated with changes in the organisation, the SMS, or its activities, prior to the introduction of such changes (section 2.4).

4.6.3.5 *Safe Control of Operations*

The safety case must demonstrate that the petroleum undertaking's processes and procedures, for managing routine and non-routine activities (including minor works, maintenance and testing etc) enable them to be planned, scheduled and carried out safely by competent persons either in the direct employ of the petroleum undertaking or otherwise.

The safety case must demonstrate that the management procedures include a robust permit to work system that ensures that interactions between nearby activities, and activities which pass between shifts, are controlled such that the risks are maintained at a level that is ALARP.

4.6.4 **Implementation and Operation**

4.6.4.1 *Senior Management Roles and Responsibilities*

An effective management structure and arrangements should be in place for delivering the safety policy. The safety case will demonstrate how management:

- Ensures the availability of resources essential to establish, implement, maintain and improve the SMS; and
- Defines, documents and communicates roles, responsibilities, accountabilities and authorities, to facilitate effective safety management.

The safety case should identify the job title of a member of senior management with specific responsibility for safety, irrespective of other responsibilities, and with defined roles and authority for:

- Ensuring that the SMS is established, implemented and maintained in accordance with the safety case; and
- Ensuring that reports on the performance of the SMS are presented to senior management for review and used as a basis for improvement of the SMS.

The identity of this senior manager should be made available to all persons working under the control of the petroleum undertaking.

4.6.4.2 *Installation Manager*

The role of the installation manager, who has day-to-day responsibility for the safety of the installation, should be described in the safety case. The safety case should demonstrate that the identified competence, authority and available resources for the role are appropriate and complied with.

4.6.4.3 *Safety Representatives*

The safety case should demonstrate how the persons working on, in or from an installation are able to select and appoint from among their number safety representatives to represent them in consultations with the petroleum undertaking in matters of safety.

4.6.4.4 *Competence and Training*

The safety case should demonstrate how the petroleum undertaking ensures that any persons performing safety critical activities are competent and have the necessary information and supervision when carrying out the activity and will describe the process for this in the safety case.

Where training is required to meet, or maintain these competency levels, the safety case should demonstrate how safety training needs are evaluated, the effectiveness of the training or action taken and the process for retaining associated records.

4.6.4.5 *Communication, Participation and Consultation*

The safety case should demonstrate how safety arrangements are:

- Underpinned by effective involvement and participation; and
- Sustained by effective communication and the promotion of competence that allows all employees and their representatives to make a responsible and informed contribution to the safety effort.

The safety case should summarise procedures for:

- Internal communication among the various levels and functions of the organisation, including those required to enable the lessons from accidents to be learned across the organisation;
- Informing workers about their participation arrangements, including who their representatives are for safety matters;
- Communication with third parties working on behalf of the petroleum undertaking; and
- Receiving, documenting and responding to relevant communications from external organisations.

The safety case should summarise procedures to ensure the participation of workers and contractors through:

- Appropriate involvement in hazard identification, risk assessments and determination of risk reduction measures;
- Appropriate involvement in incident investigations;

- Involvement in the development and review of safety policy, objectives, and the safety case;
- Consultation where there are any changes that affect their Individual Risk; and
- Representation on safety matters.

The safety case should summarise how the petroleum undertaking has implemented a safety forum on each Facility, and a safety committee for the company.

The safety case should describe how persons working on, in or from a Facility select and appoint from among their number members of the safety forum to assist the petroleum undertaking in securing the compliance with the safety case and other hazard management activities as may be appropriate.

The safety case should describe how each safety forum should select and appoint from among their number a safety delegate to represent them on the petroleum undertaking's safety committee for the purposes of achieving effective involvement in safety consultation at the company wide level.

4.6.4.6 *Documentation and Control*

The safety case must demonstrate that the documentation process in the SMS ensures the effective planning, operation and control of processes that relate to the management of all its safety risks.

4.6.4.7 *Safe Control of Operations*

The safety case should describe (and demonstrate the effectiveness of) the managerial processes and procedures that are required for safe control of operations. This will include the following as a minimum:

- Operational controls that are integrated into its overall SMS;
- Controls related to purchased goods, equipment and services;
- Controls related to third parties and contractors;
- Documented procedures to cover situations where the absence of the control (for example a Safety Critical Element) or the deviation from a stipulated operating criteria could lead to deviations from the approved safety case. If these changes become more significant and affect the basis of the safety case, the petroleum undertaking needs to consider the need for a material change (section 2.4); and
- Communication protocols for:
 - Managing vessels offloading supplies to an offshore Facility or offloading petroleum to a tanker onshore; and
 - Liaison with connected Facilities.

4.6.5 **Checking**

The safety case should demonstrate that there is a process to monitor, audit and review within the SMS. The monitoring process is a day-to-day process, which produces performance data. This process is then audited on a regular basis (section 4.5.4) and then reviewed by a third party (section 4.5.5), to determine whether the SMS is meeting the aims of the safety policy and delivering continuous improvement.

4.6.5.1 *Monitor*

Monitoring should include both hardware (equipment and materials) and human and procedural aspects (persons, procedures and systems) of the SMS.

The safety case must demonstrate that there is a process to monitor safety performance that provides for:

- Monitoring the extent to which the petroleum undertaking's safety objectives have been met;
- Monitoring the effectiveness of risk reduction measures;
- Leading safety performance indicators that actively monitor risk reduction measures to ensure their continued effectiveness ;
- Lagging safety performance indicators that reactively monitor specific occurrences to uncover weaknesses in the risk reduction measures ; and
- Recording sufficient monitoring data to enable analysis to inform future decisions.

4.6.5.2 *Audit*

Audit encompasses the structured process in which independent information is collected on the efficiency, effectiveness and reliability of the SMS and plans for corrective action are created.

The safety case must demonstrate that there is a process for internal audits of the SMS that are conducted at planned intervals to determine whether the SMS is suitable, sufficient, and effective, and is maintained to enable the petroleum undertaking to manage its safety risks.

The safety case must demonstrate how the petroleum undertaking plans, establishes, implements and reviews an SMS audit programme.

Audit procedures should be established, implemented and reviewed to address:

- The responsibilities, competencies and requirements for planning and conducting audits, reporting the results and retaining records; and
- The determination of audit criteria, scope, frequency and methods to be used.

The selection and conduct of auditors must ensure the objectivity and impartiality of the audit process.

4.6.6 **Review**

Review is the process of assessing the adequacy of the petroleum undertaking's safety performance and making decisions on actions required to correct deficiencies.

The safety case should demonstrate how the petroleum undertaking learns from all relevant experience and applies the lessons learned throughout the company, other petroleum undertakings and the oil and gas industry. Systematic reviews of performance, based on data from monitoring and audits of the SMS, should be carried out.

Senior management should ensure the SMS is reviewed at planned intervals to ensure its continuing suitability, adequacy and effectiveness. Reviews should include assessing opportunities for improvement and the need for changes to the SMS, including the safety policy and objectives.

Input to reviews (which should be carried out by independent third parties) should include:

- Results of internal audits and evaluations of compliance with legal and other requirements;
- The results of worker participation and consultation;
- Relevant communications from third parties;
- The safety performance of the petroleum undertaking;
- The extent to which safety objectives have been met;
- The status of incident investigations, corrective and preventive actions;
- Follow-up actions from previous reviews;
- Changing circumstances, including developments in legal and other requirements related to safety; and
- Recommendations for improvement.

The outputs from the reviews should be consistent with the petroleum undertaking's commitment to continual improvement and should include any decisions and actions related to possible improvements. Relevant outputs from the review should be made available for internal and external communication and consultation as appropriate.

4.6.6.1 *Incident Investigation*

The *Petroleum Incident Regulations* define those incidents that must be reported to the CER. This section covers the safety case requirements for the SMS in relation to all incidents.

The safety case must demonstrate that procedures are in place to record, investigate and analyse incidents (including near misses and unsafe conditions) in order to:

- Determine underlying safety deficiencies and other factors that might be causing or contributing to the occurrence of incidents;
- Identify the need for corrective action;
- Identify the need for improved risk reduction measures; and
- Communicate the results of such investigations throughout the organisation as appropriate to enable lessons to be learned.

The safety case should demonstrate how investigations are performed in a timely manner and the results documented and maintained.

The safety case will describe the system of classifying and categorising incidents that has been adopted so that a suitable response is demonstrated, using persons at the appropriate level of seniority and with the necessary expertise. Investigations need to be thorough enough to establish both the immediate and underlying cause(s). A phased approach should be adopted with the on-site investigation being carried out to collect evidence, followed by

the collection of off-site evidence and the laboratory analysis of components and materials removed and finally an interpretation of the findings to establish the cause.

The safety case must demonstrate that investigations provide an adequate basis for determining the level of risk and are commensurate with the severity of the potential consequences and not just the actual consequences.

4.6.6.2 *Non-conformities and Corrective Actions*

The safety case will document procedures for dealing with actual and potential non-conformities with the SMS and for taking corrective and preventive actions. The procedures should define requirements for:

- Evaluating the need for actions to prevent non-conformities and implementing appropriate actions designed to avoid their occurrence;
- Identifying and correcting non-conformities and taking action to mitigate their safety consequences;
- Investigating non-conformities, determining their causes and taking action to avoid their recurrence;
- Recording and communicating the results of corrective actions and preventive actions taken; and
- Reviewing the effectiveness of corrective actions and preventive actions taken.

4.7 **Emergency Response**

4.7.1 **Organisation**

A description of the emergency response organisation must be provided, showing the roles and responsibilities of its team members at site and off-site. It should specifically show how the following is achieved:

- How parts of the organisation at different locations are able to communicate effectively;
- Command by competent persons which can be maintained throughout an emergency; and
- Sufficient suitably competent persons on the installation to carry out emergency duties and to operate relevant equipment.

The emergency response plan should also identify any dependency on human intervention at any stage and how these persons are trained and known to be competent.

4.7.2 **Plans and Procedures**

An overview of the emergency response plan should be provided demonstrating it has addressed possible emergencies that have been identified in the safety assessment for the petroleum infrastructure, and that it provides for the implementation of that plan. The response plan should identify adequate linkages between the types of emergencies identified in the safety assessment and the parts of the emergency response plan used to control those hazardous events.

The safety case will demonstrate that the emergency response plan is an integral part of the overall SMS as a control measure subject to the same checks as all other control measures. The safety case overview of the emergency response plan therefore needs to include processes for testing, review, training and informing persons of its operation.

The safety case must demonstrate that all aspects of the emergency plan need to be realistic, workable and agreed to by the relevant parties, including those internal and external to the petroleum undertaking including other petroleum undertakings where relevant. This includes assumptions regarding actions required, timing, effectiveness of detection methods and decision-making processes and the range of emergencies that could occur. The emergency plan must be robust and take into account the conditions that may prevail in a real emergency which often make it difficult to achieve ideal responses.

The safety case must demonstrate that the emergency response plan includes:

- Coordination of resources between the internal resources of the petroleum undertaking and external, off-site agencies such as marine and aviation emergency services;
- The position of the person directing the internal emergency response and the position of the person with responsibility for liaising with the authority coordinating the external emergency plan;
- A description of the actions which should be taken to control the hazardous event and to limit its consequences;
- Coordinated recovery arrangements for persons on the petroleum infrastructure affected by a Major Accident Hazard;
- Methods to ensure that every person on the petroleum infrastructure is provided with adequate instruction and training in the appropriate action to take in an emergency and can consult written information on the use of emergency plan;
- Arrangements for informing the authorities responsible for initiating the off-site emergency plan, the type of information which should be initially conveyed to them and the arrangements for the provision of more detailed information as it becomes available; and
- An inventory of available emergency equipment, its ownership, location, transport to and mode of deployment at the petroleum infrastructure. The inventory should identify measures in place to ensure this equipment is maintained in operable condition.

The safety case must demonstrate that off-site emergency response plans are in place clearly explaining the role of relevant authorities, emergency responders, coordinators and others required for the emergency response, so that cooperation is ensured in all emergencies. Off-site emergency response plans should ensure appropriate arrangements are in place for alerting, coordinating necessary external resources and providing suitable information and advice to external persons and organisations that may be affected by the emergency.

The safety case must give an overview of the procedures for:

- Identifying persons responsible for instruction on emergency procedures;
- Reviewing emergency procedures on a regular basis;
- Ensuring that information is available at the site and another location of all persons on the location and the way in which their next of kin contact details and any other pertinent details are retained;
- Ensuring every person on the petroleum infrastructure is informed of the procedure for evacuation, the significance of emergency signals, and the location of relevant life-saving equipment;
- Arrangements for training persons in the duties they will be expected to perform, and, where necessary, coordinating this with external emergency responders; and
- Review and update of the emergency preparedness and response procedures, in particular, after periodic testing and after the occurrence of emergency situations.

For petroleum infrastructure that is connected to or one or more pipelines, the safety case will summarise procedures for shutting down or isolating, in the event of emergency, each of those pipelines so as to stop the flow of petroleum into the petroleum infrastructure through the pipeline. In particular, the procedures should include:

- Effective means of controlling and operating all relevant emergency shutdown valves for the pipeline; and
- A fail-safe system of isolating the pipeline.

The safety case must demonstrate how the petroleum undertaking complies with the Framework for Major Emergency Management.²⁴

For any installation with wells, or carrying out a Well Work Activity, the emergency response plan must:

- Provide for the possibility of a full-bore blowout event; and
- Describe the means of identifying early indicators (such as a kick) of a potential blowout and demonstrate that arrangements are in place to prevent the full development of a blowout and the actions to be taken in order to ensure safe command and control of the plant and persons from the time of the early indications through to dealing with the consequences of a full bore blowout should it occur.

4.7.3 Exercises

The safety case will demonstrate adequate provision for emergency drill exercises by persons on the petroleum infrastructure. In particular, those exercises must ensure that those persons have an adequate degree of knowledge, preparedness and confidence concerning the relevant emergency procedures.

²⁴ See <http://www.mem.ie>

The safety case should demonstrate that the following have been addressed:

- That the programme of drills covers the range of hazards that may be encountered;
- Processes for evaluating the success of drills and exercises and the management of subsequent corrective and preventative actions; and
- Involvement of external parties not at the petroleum infrastructure (e.g. external emergency services, logistics providers, onshore management etc).

For offshore petroleum infrastructure, emergency response exercises will involve the operators of standby vessels, marine and aviation emergency services as well as other emergency services which may have a role in shore-based aspects of an emergency.

5 Requirements for Well Work Safety Cases

Section 5.1 provides guidance on the scope of a Well Work Safety Case.

Sections 5.2 to 5.7 provide the structure and outline contents for a Well Work Safety Case. The content requirements of certain sections of the Well Work Safety Case are equivalent to the content requirements of a Production Safety Case (described in section 4). To avoid unnecessary duplication within these Guidelines, these content requirements are cross referenced. The requirements set out in section 3 should also be addressed where relevant within the Well Work Safety Case.

5.1 *Scope of a Well Work Safety Case*

A Well Work Safety Case covers well work activities in respect of a single well.

To carry out well work activities, a petroleum undertaking must hold a Well Work Safety Permit for those specific well work activities. In order to grant a Well Work Safety Permit, the CER must first approve a Well Work Safety Case and either a Non-production Safety Case or Production Safety Case (as the case may be) in respect of the Well Work Activity.

A Well Work Safety Case must demonstrate that the petroleum infrastructure that is carrying out the Well Work Activity is suitable for the particular well and the work being carried out, and the risks have been reduced to a level that is ALARP. Where a Well Work Safety Permit is sought through the submission of a Non-production Safety Case and a Well Work Safety Case, the Well Work Safety Case must state and demonstrate that the well being worked on is within the stated capabilities of the Non-production Installation. This does not mean that information in the Non-production Safety Case needs to be repeated in the Well Work Safety Case, but that the Well Work Safety Case must state and demonstrate that the Non-production Installation can safely carry on the Well Work Activity.

During operations such as drilling, the additional pressure containment equipment that defines the pressure containment boundary of the well, e.g. BOP and associated control equipment should be described in the Production Safety Case or Non-production Safety Case as relevant.

If the Well Work Activity is being carried out in relation to an existing well, or in relation to a well that is intended to be joined to an existing Production Installation, then the Well Work Safety Case may refer to the associated Production Safety Case as relevant. However all aspects must be covered, so that, for example, if the possibility of a blowout is greater during drilling and additional emergency response measures are required above those described in the Production Safety Case, these measures must be described in the Well Work Safety Case.

A Well Work Safety Case should demonstrate that the petroleum undertaking has carefully considered all available data in the planning of the proposed Well Work Activity and that the

risks associated with the design and execution of the activity have been reduced to ALARP. The exact conditions that are encountered subsurface and the performance of the Well Work Activity cannot be known with total certainty when the Well Work Safety Case is submitted. Therefore, the Well Work Safety Case should define an envelope of Well Work Activity and well design that can be completed safely. Careful and thorough planning and design through both scenario and contingency planning should be used to establish acceptable operating envelopes for critical design features and these should be described in the Well Work Safety Case.

Examples of the parameters that define the envelope are given below.

Example

The petroleum undertaking should consider the possibility of variations in a range of parameters such that it is known that drilling and well design is acceptable within defined parameter limits for:

- *Surface (well spud) location:* to allow movement to avoid boulders, local topography etc , shallow gas etc);
- *Target location:* to allow for movement of the well target location during drilling;
- *Pore or fracture pressure gradients:* to allow for planning of mud weight etc;
- *Reservoir fluid composition:* the petroleum undertaking should consider the possibility of encountering all fluid phases in the well design;
- *Well trajectory:* tolerable limits to the proposed well path (in the context of the geology and pore/overburden pressure regime anticipated); and
- *Casing scheme:* changes to the casing scheme in a well (i.e. casing sizes, shoe depths, cementing, etc), the need for additional casing strings (contingent strings), variation in the setting depth of casing shoes, etc.

5.2 Safety Case Purpose and Context

The requirements of this section are as per section 4.2 of these Guidelines.

5.3 Reservoir and Well Description

5.3.1 Well Location

A Well Work Safety Case for an onshore well must include a description of the surroundings that could be affected by a hazard from the well with sufficient detail to allow the assessment of the hazards created or affected by the choice of location. The location of nearby petroleum infrastructure must also be given if it has a bearing on the hazards.

With respect to either onshore or offshore wells, diagrams must be provided that show the:

- Location and orientation of the well; and
- Location of other petroleum infrastructure and pipelines that may have a bearing on hazards or their management.

A Well Work Safety Case for an offshore well must include the water depth at which the well is located.

The location and numbers of persons whose safety may be at risk from the well will be identified including workers associated with the well, well related petroleum infrastructure and members of the general public. In the case of an onshore well, the position of the well with respect to the location and numbers of the local population must be shown on a map.

5.3.2 Location Specific Conditions

The Well Work Safety Case requirements for this section are as per section 4.3.2.

5.3.3 Well Work Activities

The Well Work Activity that is being carried on in relation to the well must be described including a clear description of the well after the activity has been completed as per section 4.3.4.2. In addition, the following information must be provided:

- Well programme;
- For initial drilling of a well, seismic anomalies related to shallow gas;
- Well control philosophy and equipment including BOP type and configuration (including specific reference to the suitability for the pressure and temperature conditions); and
- Barrier policy.

Where relevant this must describe an envelope of acceptability as described in section 5.1 and 2.5.1.

5.3.4 Suspension and Abandonment

The requirements of this section are as per section 4.3.8.3.

If the Well Work Safety Case is being submitted to obtain a Well Work Safety Permit for well abandonment:

- The proposed status of the well after abandonment should be described; and
- The safety case should outline how the petroleum undertaking will address potential re-pressurisation of all the formations to virgin pressures, changes in fluid composition in the wellbore and the deterioration of the abandoned well over time.

5.4 ALARP Demonstration

The ALARP demonstration in respect of the Well Work Activity should be carried out in line with section 4.4 and the *ALARP Guidance* document.

5.5 Safety Critical Elements, Performance Standards, Assurance and Verification

The requirements of this section are as per section 4.5, insofar as they relate to the Well Work Activity. With respect to the requirements of section 4.5.5, the Well Verification Scheme should be considered in place of Facilities Verification Scheme. Any equipment downstream of the production tree or wellhead (normally defined as downstream of the outlet valves) is excluded from the Well Verification Scheme, but should be included in the associated Facilities Verification Scheme.²⁵

The safety case must include a statement of completion and summary of work carried out to complete the design part of the Well Verification Scheme. The Well Verification Scheme for the remaining steps of verification (Well Work Activity to abandonment) must be referenced in the safety case and meet the requirements in sections 2.2.1 and 2.5 of the *Compliance Assurance System* document.

The safety case must demonstrate that well integrity is maintained under all of the design operating conditions throughout the well's life.

5.6 Safety Management System

This section may refer to the Non-production Safety Case or Production Safety Case, but may be 'standalone' if a well is suspended as the well may not be covered by the SMS of any associated safety case.

5.7 Emergency Response

The requirements of this section of the safety case are as per section 4.7.

²⁵ The associated Non-production Safety Case or Production Safety Case must include any other Safety Critical Elements needed to carry out the Well Work Activity not covered under the Well Work Safety Case, such as a BOP. This equipment will need to be included within the Well Verification Scheme.

6 Requirements for Non-production Safety Cases

Section 6.1 provides guidance on the scope of a Non-production Safety Case.

Sections 6.2 to 6.7 provide the structure and outline contents for a Non-production Safety Case. The content requirement of certain sections of the Non-production Safety Case is equivalent to the content requirements of a Production Safety Case (described in section 4). To avoid unnecessary duplication within the Guidelines, these content requirements are cross referenced.

The requirements set out in section 3 should also be addressed where relevant within the Well Work Safety Case.

6.1 *Scope of a Non-production Safety Case*

The scope of a Non-production Safety Case is the Non-production Installation including all the equipment required to work on a well and control that well.

A Non-production Safety Case must demonstrate the capability of the Non-production Installation to carry out the well work activities described in a Well Work Safety Case such that the risk is ALARP. Where a Well Work Permit is sought through the submission of a Non-production Safety Case and a Well Work Safety Case, the Well Work Safety Case will state that the well being worked on is within the stated capabilities of the Non-production Installation.

6.2 *Safety Case Purpose and Context*

The requirements for this part of the safety case are as per section 4.2.

6.3 *Non-production Installation*

6.3.1 *Position and Layout*

The requirements for the description of the layout of the Non-production Installation are the same as 4.3.1, except that the position of the Non-production Installation is not required as this varies from well to well.

6.3.2 *Design Conditions*

The safety case must describe the environmental conditions for which the Non-production Installation has been designed and in which it may safely operate.

If the Non-production Installation is operating offshore, the safety case will need to include marine conditions such as, current, waves, weather, depth of water in which the Non-production Installation can operate and sea-bed conditions.

6.3.3 Hazardous Substances

The requirements for this part of the safety case are as per section 4.3.3. In addition to those requirements, if the hazardous substances vary according to the well being worked on, maximum values should be given.

The hazardous substances within the well should not be described as this will vary from well to well. However, where well fluids are seen at the surface, for example, during a well test, these should be included and the limits of such inventory described with respect to pressure, composition etc.

6.3.4 Well Operations

The well operations that the Non-production Installation can carry out should be described in a manner such that they are independent of a particular well, though any pre-conditions for safe operations should be stated. Such operations will include:

- Drilling;
- Completion;
- Workover;
- Well testing;
- Formation stimulation operations (e.g. hydraulic fracturing);
- Intervention;
- Suspension; and
- Abandonment.

The limiting conditions within which these operations can be performed safely will be given so as to enable the petroleum infrastructure's suitability for the well work activities described in a Well Work Safety Case to be assessed. In describing the above, details of the associated utilities should be given.

In terms of well control, the following must be described within the safety case:

- Equipment and arrangements to control pressure in a well and prevent the uncontrolled release of hazardous substances;
- Details of how early indicators of a potential well blowout are detected and acted upon, including the technology used, alarms with automatic executive action, procedures and worker training;
- Well control techniques used to balance pressures and keep the wellbore stable. It should be demonstrated that procedures are provided for monitoring and controlling drilling fluid (mud) density and bottom hole pressure against the reservoir (formation) pressure;
- The response to be taken in the event of a kick being detected and subsequent isolation of the wellbore from the surface, for example through the activation of blow-out preventers, closing in the well and circulating out any influx fluids in a controlled manner. This will include the type of trigger signal, the level of redundancy built into the signal system and the locations from which the blowout preventer or similar equipment can be activated; and

- Specialist well control equipment that can be deployed quickly in the event of a well blowout including the detail of such equipment, its functionality, method of connection to the well and arrangements for deployment.

6.3.5 Non-well Operations

The safety case will describe all non-well operations that are essential to the designated petroleum activity being carried out safely, such as:

- Personnel transportation (helicopter, marine access, onshore vehicle control);
- Personnel welfare (accommodation, medical, catering, HVAC);
- Logistics (supply boats, offloading, laydown, Facility loading);
- Any diving operations carried out from the relevant petroleum infrastructure;
- Marine operations that may safely be performed including the means of ensuring that marine and other operations, do not conflict in an unsafe manner;
- For a floating Installation, the means of ensuring that it safely remains in position in the stated weather window for operations; and
- For a Jack-Up, the operational parameter for the support structure (loading limits of jacket or legs), and seabed conditions.

6.4 *ALARP Demonstration*

The demonstration that all risks to safety have been reduced to ALARP in respect of the well work activities should be carried out in line with section 4.4 and the *ALARP Guidance* document, subject to the following additional guidance:

- A Non-production Installation may be used at many different locations. The Non-production Safety Case should therefore identify the range of potential hazards it may encounter in its intended use and define the conditions that will apply to ensure its safe use; and
- The specific hazards for a specific well do not need to be described in a Non-production Safety Case. However the hazards presented by the range of well work activities for which the petroleum infrastructure is suitable will be identified and a demonstration made that the risks are ALARP.

6.5 *Safety Critical Elements, Performance Standards, Assurance and Verification*

The requirements of this section are as per section 4.5, insofar as they relate to the Safety Critical Elements on the Non-production Installation.

The Facilities Verification Scheme must be referenced in the safety case and must meet the requirements in sections 2.2.1 and 2.4 of the *Compliance Assurance System* document.

The safety case must summarise that the fact that a process that meets the same aims as design and construction verification has been completed.

Example

For a semi-submersible drill rig the drilling related SCEs include, but are not limited to the riser, diverter, BOP, motion compensation, and emergency disconnect and in describing the SCEs, stack-up drawings will need to be provided.

6.6 Safety Management System

The requirements for this section of the safety case are as per section 4.6.

6.7 Emergency Response

The requirements for this section of the safety case are as per section 4.7 insofar as they are generic for different well locations, but with the following additional requirement:

- A Non-production Safety Case will provide an overview of the procedures in place to review and amend, as necessary, the petroleum infrastructure's emergency response arrangements so as to ensure they are suitable for the location of the Well Work Activity for which the petroleum infrastructure is selected.

Note that the Well Work Safety Case must include emergency response measures that are specific to the well being worked on.

7 Requirements for Design Safety Cases

Section 7.1 provides guidance on the scope of a Design Safety Case.

Sections 7.2 to 7.7 provide the structure and outline contents for a Design Safety Case. The content requirement of certain sections of the Design Safety Case is equivalent to the content requirements of a Production Safety Case (described in section 4). To avoid unnecessary duplication within the Guidelines, these content requirements are cross referenced.

7.1 *Scope of Design Safety Case*

To carry on a production activity, the petroleum undertaking must hold a Production Safety Permit for that specific production activity which will be issued pursuant to an approved Production Safety Case and, in respect of new Production Activities or Production Activities which involve a material change,²⁶ a corresponding approved Design Safety Case.

A Design Safety Case must allow the CER to assess the design of a Production Installation before it is too late in the design process to change any aspect of it. This will be at the stage in the development of the design such that there is sufficient information available to allow an assessment by the CER of those features that cannot readily be changed later in the project. Thus, the timing of the submission is important in that the design should not have progressed so far that change is difficult and expensive, but also not be so early that there is insufficient detail to allow anything other than a very high level, generic assessment.

Therefore, the Design Safety Case should detail the basic nature of the proposed petroleum infrastructure (floating, subsea, fixed jacket etc), the nature of the hydrocarbon export method and the basic design with respect to key safety parameters of any processing plant and equipment together, for an offshore installation, with layout and accommodation for the expected number of persons on-board. In short, the key Safety Critical Elements will have been considered and the concept for them defined such that the way in which hazards are managed and risks are reduced to ALARP is evident.

The Design Safety Case is not a document that needs to be maintained in tandem with the Production Safety Case. Its purpose is served once the design has been constructed and the corresponding Production Safety Case approved.

If a Design Safety Case is being submitted in relation to a material change to an existing Production Safety Case, this new Design Safety Case need only cover aspects that are relevant to the change. This means that for some changes, (e.g. new riser from a subsea well) the Design Safety Case may be a relatively short document, while for a major change

²⁶ Where a petroleum undertaking has had a plan of development submitted pursuant to a petroleum lease approved by the Minister prior to the publication of these Guidelines, the petroleum undertaking shall not be required to submit a Design Safety Case in the first instance.

(e.g. a new onshore production train) it will be a larger document and potentially similar in extent to a Design Safety Case for a new Facility. For the case of a material change, the Design Safety Case can refer to details contained in the corresponding Production Safety Case. For the example of a new riser from a subsea well, it is likely that the SMS section of the Design Safety Case simply refers to the SMS in the Production Safety Case, though the petroleum undertaking has to always ensure that the SMS covers all aspects of the operation.

If a material change occurs to the Design Safety Case, it needs to be resubmitted to the CER for approval. The threshold for whether a change is material in relation to the Design Safety Case is a higher one than for a Production Safety Case, due to the fact that it is describing the petroleum infrastructure, its safety systems and the demonstration that all risks to safety have been reduced to ALARP is at a higher level.

7.2 Safety Case Purpose and Context

The requirements of this section are as per section 4.2 of these Guidelines.

7.3 Petroleum Infrastructure Description

7.3.1 Position and Layout

The requirements of this section are as per section 4.3.1 of these Guidelines.

7.3.2 Location Specific Conditions

The requirements of this section are as per section 4.3.2 of these Guidelines.

7.3.3 Hazardous Substances

There should be sufficient information available with the Design Safety Case to show the identification and approximate quantity of all the hazardous substances with the potential to cause a Major Accident that will be on or flowing through the petroleum infrastructure.

Diagrams must be provided to show the:

- Locations of the hazardous substances;
- Segregation and barriers (fire and blast walls) employed to separate hazards from safe areas; and
- Routes of all pipelines and risers including those connected to other petroleum infrastructure and wells.

7.3.4 Reservoir and Well

A Design Safety Case is only required as a precursor to a Production Safety Case. As such well and reservoir characteristics need only be described here a well that is intended for production purposes whether that be hydrocarbon production, water injection, or otherwise. An exploration well would not need a Design Safety Case.

7.3.4.1 Reservoir

The following information should be provided for the reservoir or reservoirs that the well(s) is located in:

- Seismic anomalies related to shallow gas;
- Formation geological details;
- Basic reservoir data, including:
 - Pressure;
 - Temperature; and
 - Depth to reservoir tops and reservoir thickness.
- Reservoir fluid composition; and
- A specific note should be made of the presence of H₂S and CO₂.

7.3.4.2 Well

The following should be described for each well, with suitable diagrams where appropriate:

- Well identification and top hole location (either specific point or defined area);
- Purpose of well (production, injection, etc);
- Depth references;
- List of offset wells that are relevant for this particular well;
- Well operating parameters:
 - Maximum expected operating pressure; and
 - Maximum and minimum expected operating temperature;
- Overburden geological data:
 - Geological setting;
- Well construction data:
 - Preliminary well trajectory; and
 - Barrier policy.

7.3.5 Petroleum Infrastructure Connected to the Facility

The requirements of this section are as per section 4.3.5 of these Guidelines.

7.3.6 Persons

The requirements of this section are as per section 4.3.6 of these Guidelines.

In addition, the Design Safety Case must show how the proposed manning arrangements have been derived such as to provide an adequate level of manning for safe operations.

7.3.7 Operations

The Design Safety Case must outline all designated petroleum activities and related petroleum infrastructure intended to be carried out pursuant to the Production Safety Permit.

The intended operations relating to petroleum processing should be described in the Design Safety Case. Activities that are needed for the designated petroleum activity, such as marine operations and the ability to stay on station for an FPSO should be described and any weather limitations given.

The safety case should also contain a high-level description of all operations that will be required to service and maintain the petroleum infrastructure, which may include:

- Personnel transportation (helicopter, marine access);
- Personnel welfare (accommodation, medical, catering);
- Material logistics (supply boats, offloading, laydown, Facility loading); and
- Any diving operations from the petroleum infrastructure.

7.4 ALARP Demonstration

The safety case must demonstrate how the petroleum undertaking will reduce risks associated with petroleum activities it will carry on to a level that is ALARP. The *ALARP Guidance* document provides guidance as to how demonstrate that all risks to safety have been reduced to ALARP.

The ALARP demonstration should cover the designated petroleum activities, as well as demonstrating that the General Duty is being discharged by the petroleum undertaking.

The ALARP demonstration for the proposed concept must include the basic concept and the critical design aspects that could have a significant impact on the risk generated by the proposed designated petroleum activity. It must cover and describe the full range of concepts that have been considered (essentially as risk reduction measures) for exploitation of a field. The location of significant equipment items such as a compressor package (the details of this package would not be required) would also need to be included.

Example

For offshore developments consideration should be given to options such as fixed, floating, bridge-linked structures, Normally Unattended Installations (NUIs) or a subsea development and pipeline options). For onshore developments, options on wells, plant and pipelines and their locations are likely to need consideration.

7.4.1 Methodology

The requirements for this section are as per section 4.4.1.

7.4.2 Hazard and Risk Reduction Measure Identification

The requirements for this section are as per section 4.4.2, but only in relation to the identification and description of the high level and more critical hazards and risk reduction measures as they relate to parts of the design that cannot readily be changed.

7.4.3 Good Practice

The requirements for this section are as per section 4.4.3. It is emphasised that the safety case must demonstrate how inherent safety has been implemented.

7.4.4 Risk Tolerability

A quantified risk assessment should be used to produce a risk estimate to judge against the risk tolerability criteria. This assessment should be to a level of detail sufficient to show that the proposed option does not impose risks that are intolerable. Guidance on how to undertake such a risk assessment at the early stage of a design is given below.

For the first well of a number of wells, the safety case should also demonstrate that the risk from the final arrangement of all wells is below the Upper Tolerability Level.

7.4.5 Quantitative Risk Assessment

For the Design Safety Case, the broad approach to QRA is as for the guidance for the Production Safety Case, except that the level of detail may be less. Design philosophies may also specify return frequencies to be used for accidental loads, such that, although the accident loads are not defined, the frequency of them being exceeded is known. Combined with basic facts about location, ventilation and the expected process details, the risk may be estimated to a degree that is sufficient to show that risks are not intolerable.

Example

In a Design Safety Case, the quantitative risk assessment for an offshore process area might use leak frequencies for process units based on comparison with similar existing designs.

Consequence assessment using exact process parameters may only be needed in certain circumstances. For example, setting the distance between an onshore boundary fence and the process equipment, or determining the length of a bridge between two offshore platforms.

7.4.6 ALARP Assessment

7.4.6.1 Safety Critical Elements

For those Safety Critical Elements that can be readily altered as the design progresses and do not have a fundamental impact on the layout, or design, only the fact that they have been identified as safety critical is required to be demonstrated. Examples of this include positions of exit points from a boundary fence on onshore petroleum infrastructure (which may be important, but can usually be moved) and emergency lights and liferaft locations offshore.

For those Safety Critical Elements that are fundamental to the design, the high level performance of the SCEs must be given in quantitative terms wherever possible and should demonstrate how those choices that have been made in relation to SCEs are ALARP. If this performance is not critical to the design at this stage and does not have a material effect on the risk, then the broad process for deciding this should be described. For the SCEs that need to be described, just those factors that cannot easily be changed during the design, or have a significant impact on the risk, should be identified.

Example

If the layout of an offshore platform includes a blastwall, its location should be identified, but the precise blast withstand capacity that it will eventually have does not need to be provided, but the high-level process by which it will be determined and ALARP is achieved needs to be described. In addition, the process by which it was determined that the blastwall is required as opposed to, say, a solution involving a bridge-linked platform where the blastwall was not required should be described in the ALARP demonstration.

Example

The temporary refuge and evacuation arrangements for an offshore installation need to be designed for a certain number of people. This number is difficult to change as the design progresses and so the number of persons on the installation needs to be given in the Design Safety Case and this number should correspond to the expected operations to be carried out on the installation.

Example

As part of the hydrocarbon containment SCE, an overview of the corrosion management strategy is required, but without the need for specific corrosion allowances to be identified.

Example

If 3 × 50% fire pumps have been selected rather than 4 × 50%, this should be included in the ALARP demonstration as it is usually not possible to add an additional fire pump later in the design. If the choice has not been made, a high level description of the process that will be used to determine the layout should be given with the safety case showing that the design is equally capable of both outcomes.

In relation to on-going assurance once the plant is operational, where critical decisions are made early in the design process that have a significant bearing on the risk, the number of persons required on the petroleum infrastructure or similar, this should be described. For example, if a pipeline is such that internal inspection by a pig is not possible, this restricts the type of assurance activities that can be done and so a demonstration of why it is ALARP to do this is required.

7.4.6.2 *Hazards and Inherent Safety*

The safety case must summarise the range of the options for the development and summarise how the selected concept reduces risks to a level that is ALARP. In doing so, it must demonstrate that the risk from each hazard is reduced to a level that is ALARP. This will involve the consideration of, amongst other things, inherent safety and risk reduction measures that are not in themselves SCEs including:

- Elimination and substitution of hazards;
- Overall concept (subsea wells, manned platforms etc);
- Inherent safety;
- Layout;
- Reduction of potential leak points;
- Location of the petroleum infrastructure;
- Distribution and number of persons; and
- Means of transportation.

7.5 **Verification**

A summary of the design Verification Scheme that will be used during the on-going design process (see sections 2.2.1 and 2.4 of the *Compliance Assurance System* document for further details) is required.

7.6 **Safety Management System**

Although there is no requirement for detailed operational aspects to be included, the Design Safety Case must provide sufficient information to describe the major aspects of the operational SMS (as detailed in section 4.6) and demonstrate the broad approach to safety management.

7.7 **Emergency Response**

The requirements for this section are as per section 4.7.

8 Requirements for Decommissioning Safety Cases

Section 8.1 provides guidance on the scope of a Decommissioning Safety Case.

Sections 8.2 to 8.7 provide the structure and outline contents for a Decommissioning Safety Case. The content requirement of certain sections of the Decommissioning Safety Case is equivalent to the content requirements of a Well Work Safety Case (described in section 5) and/or a Production Safety Case (described in section 4). To avoid unnecessary duplication within the Guidelines, these content requirements are cross referenced.

8.1 *Scope of Decommissioning Safety Case*

The scope of the decommissioning safety case is taken from the *Designated Petroleum Activities Regulations* and is up to the point where any apparatus designed to contain or convey petroleum that comprises or forms part of such petroleum infrastructure is free of hydrocarbon.

Where there is decommissioning of a pipeline, or commencement, or preparation for the removal of primary or secondary structures with a view to complete decommissioning of the petroleum infrastructure, the petroleum undertaking must hold a Decommissioning Safety Permit for that specific decommissioning activity which will be issued pursuant to an approved Decommissioning Safety Case.

A Decommissioning Safety Case must describe the process of decommissioning and demonstrate how the risks associated with that process are reduced to a level that is ALARP.

Where there is decommissioning of a part of petroleum infrastructure described in a Production Safety Case, this will be captured and assessed through the material change process in respect of the Production Safety Case. There is no requirement to produce a Decommissioning Safety Case in respect of a partial decommissioning of petroleum infrastructure.

8.2 *Safety Case Purpose and Context*

The requirements of this section are as per section 4.2 of these Guidelines. To the extent not already required by section 4.2.5, the Decommissioning Safety Case should identify all organisations contracted to the petroleum undertaking, or with whom the petroleum undertaking must co-operate in order to secure the safe management of the decommissioning. That may include among others, heavy lift ship operators and diving support vessels.

8.3 *Petroleum Infrastructure Description*

The initial (pre-decommissioning) and final state (post decommissioning) of the petroleum infrastructure will be described in this section.

8.3.1 Position and Layout

The requirements of this section are as per section 4.3.1 of these Guidelines. In addition to satisfying the requirements of section 4.3.1, with respect to the petroleum infrastructure to be decommissioned, the safety case should also describe the position of the petroleum infrastructure and other equipment employed in the decommissioning where this has an impact on the hazards and risk of decommissioning. This includes heavy lift vessels.

8.3.2 Location Specific Conditions

The requirements of this section are as per section 4.3.2 of these Guidelines.

8.3.3 Hazardous Substances

The requirements of this section are as per section 4.3.3 of these Guidelines.

8.3.4 Petroleum Infrastructure Connected to the Facility

Any infrastructure that may have a bearing on decommissioning should be described, noting that connected infrastructure should have been removed, or altered such that it presents no major accident hazards to the petroleum infrastructure, in order for decommissioning to commence.

8.3.5 Persons

The requirements of this section are as per section 4.3.6 of these Guidelines. If the maximum POB expected to be on the petroleum infrastructure in the course of the decommissioning activity changes, this should be highlighted and the safety case must demonstrate that that it is sufficient.

8.3.6 Operations

The sequence of major decommissioning operations required to make the installation hydrocarbon free should be described.

The accommodation arrangements for persons working during all stages of the decommissioning must be described.

Any other petroleum infrastructure involved in the decommissioning process must be described (e.g. heavy lift vessels).

8.3.7 Well and Reservoir

Wells and reservoirs needs to be described as per the guidance in section 5.3 if the wells have not been abandoned.

8.4 ALARP Demonstration

The requirements of this section are as per section 4.4 of these Guidelines and the *ALARP Guidance* document.

8.5 Safety Critical Elements, Performance Standards, Assurance and Verification

The requirements for this section are as per section 4.5 for those Safety Critical Elements that remain in operation during the decommissioning process, recognising that the extent and nature of the hazards to be managed during decommissioning are different from production.

The Facilities Verification Scheme and Well Verification Scheme must be referenced in the safety case and meet the requirements in sections 2.2.1, 2.4 and 2.5 of the *Compliance Assurance System* document.

8.6 Safety Management System

The requirements for this section are as per section 4.6.

The SMS should demonstrate that systems are in place to assess and safely manage Major Accident risks from adjacent petroleum infrastructure, residual hydrocarbons, residual flammable, toxic, ionising, or explosive substances, dismantling and demolition activities, and for offshore infrastructure, marine activities with major accident risks such as heavy lifts.

8.7 Emergency Response

The requirements for this section are as per section 4.7.

9 Publication of Approved Safety Cases by Petroleum Undertakings

Section 13AC(1) of Part IIA of the Act requires a petroleum undertaking that has been issued with a safety permit to make available a copy of the approved safety case to which that permit relates to any member of the public who requests it.

Under section 13AC(2), this obligation does not extend to any content of an approved safety case that relates to the following matters:

- industrial confidentiality;
- commercial confidentiality;
- personal confidentiality;
- public security; or
- national defence.

Under section 13AC(3) of the Act, a petroleum undertaking must obtain the written consent of the CER in order to omit any approved safety case content for the purposes of publication.

Under section 13AC(4) of the Act, a petroleum undertaking that makes available a copy of an approved safety case is entitled to charge a fee to the person who requests it. This fee shall not exceed an amount which is reasonable having regard to the cost of making it available and the CER may give the petroleum undertaking such direction as it considers appropriate in relation to what is a reasonable fee.

This purpose of this section of the Safety Case Guidelines is to set out the following:

- (a) the CER consent process for the exclusion of information from the “public version” of an approved safety case (section 9.1);
- (b) CER guidance on the application of the matters listed in section 13AC(2) of the Act (section 9.2); and
- (c) a direction by the CER under section 13AC(4)(b) of the Act in relation to the reasonableness of the fee charged under section 13AC(4)(a) of the Act (section 9.3).

For the purposes of this Paper, matters listed in section 13AC(2) of the Act (industrial, commercial or personal confidentiality, public security or national defence) are together termed the ‘Exclusion Criteria’.

9.1 CER Consent Procedure for Public Version of Approved Safety Case

Section 13AC(3) states that where a petroleum undertaking proposes to rely on section 13AC(2) to exclude certain information from the public version of its approved safety case, “it shall obtain the prior written consent” of the CER.

The following procedure should be followed to obtain CER consent:

1. Within four weeks of a request being made by a member of the public for a copy of the approved safety case, the petroleum undertaking, should it believe any of the Exclusion Criteria apply, shall submit the following to the CER:

- a. the exact content which the petroleum undertaking proposes to exclude from the public version of its approved safety case, if any;
 - b. if it proposes to exclude any content, the Exclusion Criteria on which it proposes excluding this information; and
 - c. if it proposes to exclude any content, a detailed explanation as to why the information falls under section 13AC(2).
2. The CER will provide either:
 - a. written consent to all of the exclusions;
 - b. written consent to part of the exclusions only and a written refusal of consent to the remaining exclusions; or
 - c. a written refusal of consent to all of the exclusions.
 3. In the case of a refusal or part refusal of consent, the CER will provide an outline of the reasons for its decision.
 4. Having received the CER's decision and the fee from the requester, the petroleum undertaking will provide the public version of the approved safety case, as soon as possible, unless the petroleum undertaking provides further submissions under subparagraph 5 below.
 5. If the petroleum undertaking disagrees with the CER's refusal or part refusal to consent to the exclusion of certain information, it may make submissions to the CER outlining its concern(s) within two weeks of receiving the CER's refusal or part refusal.
 6. The CER will consider the petroleum undertaking's submission and will revoke, amend or confirm its original decision. The CER will provide an outline of the reasons for its decision if the refusal to consent, or part of it, stands. Following the CER's decision and the fee from the requester, the petroleum undertaking will, as soon as possible, provide the public version of the approved safety case to the requester.

This procedure shall be followed the first time the petroleum undertaking receives a request for the safety case from a member of the public. The version of the approved safety case approved by the CER under this procedure will be considered the "public version" of the approved safety case for all subsequent requests.

9.2 Guidance on the Application of the Exclusion Criteria

As stated at the outset of this section, under section 13AC(2) of the Act, the obligation on a petroleum undertaking to make available their approved safety case to any member of the public upon request does not extend to any content of the approved safety case that relates to the following matters:

- industrial confidentiality;
- commercial confidentiality;
- personal confidentiality;

- public security; or
- national defence.

Where a petroleum undertaking proposes to omit certain information from the public version of its approved safety case under section 13AC(2) and has submitted such a proposal to the CER under the procedure set out in section 9.1 the CER shall approve or disapprove the proposed exclusion(s) following its consideration of the Exclusion Criteria.

Further guidance on the Exclusion Criteria are set below.

9.2.1 Scope of the public version of the approved safety case

Under section 13A of the Act, an “approved safety case” is defined as “a safety case in respect of a designated petroleum activity or activities which has been approved by the Commission pursuant to the provisions of this Part and includes any revision made to a safety case which (a) may take effect without prior approval of the Commission, or (b) has been approved by the Commission.”

Safety cases may contain mentions of, or references to separate documents, for example, policies and procedures, without attaching these documents to the safety case. The CER may request sight of these documents for the purposes of determining if they are sufficient in the context of approving the safety case. For the purposes of providing a public version of an approved safety case, the petroleum undertaking is required to provide only the safety case approved by the CER. Petroleum undertakings are not required to publish referenced documents, regardless of whether the CER requested to review them.

9.2.2 Guidance on Exclusion Criteria

When considering a request to exclude content that relates to the Exclusion Criteria, the CER will always be mindful of the public interest. The CER will always balance the importance the legislature has placed on public access with protecting privacy and ensuring security and defence are not compromised, which are in the interest of both the public and the petroleum undertaking. That being said, the following sections set out the CER guidance on each of the Exclusion Criteria:

- Industry & commercial confidentiality (section 9.2.2.1);
- Personal confidentiality (section 9.2.2.2);
- Public security (section 9.2.2.3); and
- National Defence (section 9.2.2.4).

9.2.2.1 Industrial & Commercial Confidentiality

For the purposes of reviewing whether to approve the exclusion of information from an aspect of an approved safety case for the purposes of publication, “industrial confidentiality” and “commercial confidentiality” will be taken as interchangeable terms.

The CER may approve the exemption of certain information from disclosure under section 13AC(2) if that information contains:

- (a) a trade secret;
- (b) financial, commercial, scientific, technical or other information whose disclosure could reasonably be expected to result in a material financial loss or gain to the person to whom the information relates or could prejudice the competitive position of that person in the conduct of his or her profession or business or otherwise in his or her occupation; or
- (c) information whose disclosure could prejudice the conduct or outcome of contractual or other negotiations of the person to whom the information relates.

In determining whether information constitutes a “trade secret” in the application of paragraph (a) above, the following criteria may be considered by the CER:

1. the extent to which the information is known outside the business;
2. the extent to which the information is known to employees and others involved in the business;
3. the protective measures taken to guard the secrecy of the information;
4. the value of the information to the owners and the owner’s competitors;
5. the amount of money or effort expended by the owner to develop the information;
6. the ease or difficulty with which the information could be properly acquired or duplicated by others.

In applying paragraph (b) above, the phrase “financial, commercial, scientific, technical or other information” shall be interpreted broadly by the CER to relate to all information relevant to the business. The type of information shall not in itself be determinative of whether or not this criteria applies. The test shall be whether disclosure of that information (whether financial, commercial, scientific, technical or other) could reasonably be expected to result in a material financial loss or gain to the person to whom the information relates or could prejudice the competitive position of that person in the conduct of their profession or business or otherwise in their occupation.

9.2.2.2 *Personal Confidentiality*

The CER may approve the exemption of certain information from disclosure under section 13AC(2) if that information contains personal information.

For the purposes of this exclusion criterion, “personal information” means information about an identifiable individual that:

- (a) would in the ordinary course of events, be known only to the individual or members of the family, or friends, of the individual; or
- (b) is held by the petroleum undertaking on the understanding that it would be treated as confidential.

9.2.2.3 *Public Security*

The CER may approve the exemption of certain information from disclosure under section 13AC(2) if the information could reasonably be expected to:

- (a) prejudice or impair lawful methods, systems, plans or procedures for ensuring the safety of the public and the safety or security of persons and property;
- (b) prejudice or impair the security of a building or other structure or a vehicle, ship, boat or aircraft;
- (c) endanger the life or safety of any person;
- (d) facilitate the commission of an offence; or
- (e) in any other way not covered by (a) – (d) above, prejudice public security.

9.2.2.4 *National Defence*

The CER may approve the exemption of certain information from disclosure under section 13AC(2) if its publication could reasonably be expected to adversely affect the:

- (a) security of the State;
- (b) defence of the State; or
- (c) international relations of the State.

If a petroleum undertaking requests the exclusion of certain information from publication on the grounds of national defence, then in considering this criteria the CER must discuss the matter with the Minister for Defence and, if relevant, other ministers and other members of the Department of Defence.

9.3 ***Direction on fee for public version of approved safety case***

Section 13AC(4)(a) entitles petroleum undertakings to charge the person who requests the approved safety case a fee in respect of making the copy available. The fee must not exceed an amount which is reasonable having regard to the cost of making it available.

Section 13AC(4)(b) allows the CER give the petroleum undertaking a direction it considers appropriate in relation to what is a reasonable fee.

Once the approved safety case is modified to reflect exclusions approved by the CER under section 13AC(3), this shall be considered the “public version” for all subsequent requests. Therefore, the majority of the work involved in preparing the public version of the safety case will only have to be done once. The CER is of the view that it is not reasonable for one member of the public to be burdened with a higher fee than others to cover the cost of this exercise, simply because that person made the request first. However, there is no way to know how many requests there will be in the future and so realistically the actual cost of modifying the approved safety case for publication cannot be split evenly between all requesters.

It must also be recognised that the principle underpinning the requirement to make available a public version of the approved safety case is that that public access to this information is in the public interest and any fee charged should be nominal.

On the basis of the above, the CER is of the view that a standard, nominal fee is appropriate.

The CER directs that €5 is a reasonable fee to provide a member of the public with the public version of the approved safety case in CD format. The CER also directs that approximately €100 is reasonable for a paper version, should it be requested, given the cost of production. Given the expense of producing a colour copy, should this be requested, the CER directs that it is reasonable that the petroleum undertaking recover the full cost from the requester. Should the requester complain to the petroleum undertaking that the price charged is unreasonable, then the petroleum undertaking shall seek a direction from the CER as to what constitutes a reasonable fee in the circumstances, and shall charge as per the CER's direction.