Improving offshore safety in Europe

The Bellona Foundation's reply to the consultation on the EU safety legislation for offshore oil and gas activity

May 20, 2011

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

Authorisations

1. *Which changes, if any, would you recommend to the authorisation conditions for offshore prospection or exploration or production activities? Please specify which authorisations your recommendations concern (all authorisations, those in a specific country, those authorising only a certain stage(s) such as prospection, exploration or production etc)*

The following statements concern authorities granting and supervising petroleum exploration and production licences. In this reply Bellona considers the prospecting phase as part of the exploration phase.

The national petroleum concession system should give the competent authorities the legal basis for controlling each phase of the petroleum activity, from the opening of an area to its closing. It is particularly when issuing an exploration licence or a production licence (PDO) that the authority has the possibility to control and command the development of a petroleum deposit and to require sustainable hydrocarbon exploitation with a minimum of discharges and emissions.

1.1 Authorising an exploration licence

An exploration licence should include separate authorisation processes of which some are **1)** consent to carry out exploration drilling **2)** approval of an emergency response plan and **3)** approval of an abandonment plan.

When assessing an operator's plan for exploration drilling, the competent authority should require, through injunctions and prohibitions:

- A minimum of discharges and emissions to air and water. Among these, but not exclusively; 1) Setting emission limit values for radioactivity, environmental toxics, and total hydrocarbon content (THC) in discharges to sea; 2) Setting emissions limits values for greenhouse gases (GHG) (CH_4, nmVOC, SO_x, NO_x etc.).
- The use of best environmental available technologies (BAT)[1]

[1] As defined in DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast) (Text with EEA relevance) Article 3 (10).

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

- Identification of special safety and working environment challenges linked to the activities covered by the application, including the environmental vulnerability of the area
- The submission of a worst case scenario environmental impact assessment
- A baseline environmental survey should have been carried out prior to applying for an exploration licence and used as input when evaluating the licence application.

When assessing the hydrocarbon field operator's **Emergency response plan**, the competent authority should require, through injunctions and prohibitions (see also Q17 in this response):

- An emergency response based on the consequences of a given failure[2]
- The use of best environmental available technologies **(BAT)** (see also Q5 in this response)
- An assessment of the possibilities to improve the specialization of equipment, organization and personnel
- An assessment of the different alternatives regarding capacity and suitability of personnel and equipment for hydrocarbon spill control and a subsequent plan for ensuring sufficient capacity and suitability of
  personnel and equipment for hydrocarbon spill control
- The use of **common EU guidelines** for prioritizing natural value, vulnerability, the need for protection of coastal areas, etc.
- Collaboration with local authorities on traffic monitoring for reduced risk of having a ship colliding with an installation

The hydrocarbon field operator's **Emergency response plan** should be **authorised by two instances**; **1)** The national competent authority and **2) the EMSA.**

1.2 Authorising a production licence

A production licence should include separate authorisation processes of which some are **1)** the approval of a plan for development and operation (PDO) **2)** approval of an emergency response plan and **3)** approval of an abandonment plan

1. When assessing the hydrocarbon field operator's **Plan for Development and Operation (PDO)**, the competent authority should require, through injunctions and prohibition, a sound hydrocarbon extraction by setting:

[2] In contrast to an emergency response based on the probability of an event occuring

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium
Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22
Belgian organisation number
0458.243.836
www.bellona.org

- Requirements for recovery rates (e.g. WAG, CO_2 for EOR, evaluate whether produced water can be used as pressure support).
- Requirements for operational spills and emissions to water and air. Among these, but not exclusively; 1) Setting emission limit values[4] radioactivity, environmental toxics, and total hydrocarbon content (THC) in discharges to sea; 2) Setting emissions limits for greenhouse gases (GHG) (CH_4, nmVOC, SO_x, NO_x etc.).
- Requirements for monitoring operational spills and emissions to water and air. See bullet-point above.
- Requirement to assess the use of best environmental available technologies (BAT – as defined in Article 3(10, 11, 12 and 13) of Directive 2010/75/EU[4]): If for any reasons the use of BAT are not required by the authority as a condition for approval of the PDO, it should not prevent the authority to require that suitable space on the installation is set aside for the later deployment of BAT (for example equipment for CO_2 injection for EOR or cleansing of produced water). With regards to setting requirement for tertiary oil production in terms of CO_2-EOR, a stringent approximation to such a regulatory incentive can be found in the Danish regulative framework where operators are obliged to enter into negotiations on a possible continuation of the activities after the expiry of the concession, issued on 8 July 1962, concerning the areas which are relinquished on 8 July 2012.
- Requirements to carry out environmental surveys in order to monitor the environmental impact of hydrocarbon operations. Relevant data collection will be acquisition of bathymetry data, chemical composition data from water column and bottom sediments (measuring e.g. total hydrocarbon concentrations (THC), heavy metal concentrations, toxics etc.), and inspections of the bottom fauna (by e.g. camera, sediment and fauna sampling or ROVs).
- **Monitoring requirements:** Such monitoring requirements will include e.g. pressure monitoring, emissions to air and water, the sea bottom, integrity of installations and the subsurface (progradation of faults and fractures, migration of injected masses, depletion of hydrocarbons etc.).
- **Requirement of environmental monitoring** mapping the state of the sea, sea-bottom and organisms at, adjacent to and in the region of the installation (including chemical measurements, sediment sampling, visual inspection of bottom fauna, inspecting bottom topography etc.). In Norway there is a requirement to perform monitoring of the external environment in terms of e.g. benthic habitats, the water column, total

[4] DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

hydrocarbon content, chemicals, heavy minerals and sediment sampling[5] at regular time-intervals. Such intervals should be every second year.

- A baseline environmental survey should have been carried out prior to applying for a production licence and used as input when evaluating the application.
- The submission of a worst case scenario environmental impact assessment
- For ships used in the oil and gas sector, integration of ship safety standards with offshore petroleum production (and exploration) safety standards, traffic monitoring and emergency spill preparedness plans should be required (see Q4 on "Mobile offshore units" in this response)

When assessing the hydrocarbon field operator's **Emergency response plan** the same recommendations as listed in **1.1 Authorising an exploration licence** apply.

1.3 Authorising a pipeline licence

In e.g. Norway pipeline operations are not covered by the production licence. As offshore pipelines are subject to safety and environmental risks it is recommended that the competent safety authority issues and supervises pipeline licences.

2. *European law foresees that the competent national authorities shall ensure that authorisations are granted on the basis of selection criteria which consider, among other things, the financial and technical capability of the companies wishing to carry out offshore oil or gas operations.*
a) *What key elements should this technical capacity requirement include in your view?*

It should be required that prospective operators or unincorporated joint ventures demonstrate that they have the technical capacity required to plan and carry out operations. They should demonstrate their ability to take all appropriate measures to prevent and respond to emissions, discharges, spills and critical events, taking into account the operating conditions of the given location and the character of activities for which a concrete licence is sought.

This should also apply when the operators make use of sub-contractors: operators should make sure that any one working or performing work or services for them apply the same requirements (as it applies for liability issues).

[5] The monitoring of the benthic habitats shall contribute to explaining whether a station or a larger area around the individual facility or in a region is affected by discharges from the activities, see guidelines regarding the Activities regulations Section 52 to 59 see also http://www.ptil.no/activities/category404.html#_Toc280602768

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

b) ***Similarly, what key elements should the financial capability requirement include in your view?***

Financial capability to cover liabilities in the case of accidents is a criterion that should mainly aim at incentivizing the prevention of accidents. The principle should be that the liability of the licencee for pollution damage is **a strict and unlimited liability** and that the licencee should provide a financial security to cover such liability[6]. **Absolute capping of liabilities should be avoided**. However, as financial guarantee for unlimited pollution damages can be challenging to establish (due to limited insurance capacity), a solution could be to require a **financial security up to a ceiling**, which would be determined on a case-by-case basis by national authorities based on Commission guidance.

Above the ceiling, in order to prevent the bill from ending up mainly with tax-payers, there could be some **mutualisation of the responsibility** of operators in case of leakage, both during the operational phase and after the closure of a field. **A trust fund** should be established at EU level, similar to the International Oil Pollution Convention Fund, but this should only cover a significant portion of liabilities beyond a high ceiling (e.g. 75% of liabilities above €1bn). The **remaining liability** not covered by the financial guarantee and not covered by the EU Fund would be **directly born by the licencee and/or individual having executive functions**. The Fund would be alimented by operators; they would have to pay a set fee per tonne of oil equivalent produced, this fee being according to the risk the operator carries[7].

It is important that at least some financial liability (in addition to possible criminal liabilities), also above the level at which the trust fund intervenes, sticks to individuals having executive functions in companies that fail to cover their liabilities (residual liability) arising from accidents. When fault or negligence can be demonstrated, such individuals should be barred from having executive functions in other companies involved in exploration or production of petroleum.

3. How (such as through legislation or voluntary measures at international, EU or national levels or by industry) should the adoption of state-of-the-art authorisation practices be

[6] A worse case scenario for oil leakage should be required and serve to partly establish the amount of financial security required.

[7] If the risks are deemed the same at any regulated site, a larger operator should cover a proportionately larger risk

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

best achieved throughout the EU? Should neighbouring EU Member States be consulted on the award of authorisations?

Adoption of state-of-the-art authorisation practices

1. Authorisation practices must **ensure transparency**, both intra-MS, but also amongst competent authorities and relevant institutions nationally. Transparency would be achieved through the acquisition and subsequent publication of relevant data and statistics of undesired occurrences (like leakages, spills, blow-outs, fires, loss of safety barriers, helicopter accidents etc.) from the industry, via the national competent authorities, and **coordinated by an EU agency**. A subsequent publication of statistics and relevant data should be issued by the EU agency (complementing publications by the national competent authority if such publications currently exist).
2. All authorisation processes should be granted according to an **overall goal of responsible petroleum resource management**. In this lies a safe and sound exploitation of resources taking into account a high recovery rate, a safe workplace and a minimum of emissions to air and water.
3. In Norway operators must **obtain consent** from the authorities **at important milestones** in order to be able to continue their activities. Such milestones are e.g. drilling of exploration wells, onset of production at a facility, major construction or reconstruction, life-time expansion of a facility and disposal of a facility. The authorities may conduct verifications after consent has been granted in order to confirm that the activity is being carried out in accordance with the current regulations and licence conditions[8]. According to Bellona`s experience this system enables a time- and site-specific assessment by the authorities of the proposed activity. It also allows the competent authority to ensure that the operator carries out the activity in accordance with the regulations and safety standards.
4. Bellona's view is that a state-of-the-art authorisation should aim at ensuring a sound petroleum resource management. The authorization process should be dynamic and not static, in the sense that the competent authority should be empowered to issue specific consents at specific milestones and also set specific complementary requirements necessary to ensure a sound petroleum resource management. Such potential changes should however be sufficiently predictable for the operators (and investors).
5. The motivations for issuing consents at important milestones and obtaining a dynamic authorisation process are 1) a **dynamic approach to best available technologies** 2) a **dynamic approach to risk**; risk associated with the exploration and

[8] see "Issuing of consents" at http://www.ptil.no/consents/category160.html

production of petroleum will evolve as parameters influencing decision making; like knowledge, technology, cost benefits, sub-surface pressures, abrasion of equipment etc. changes.

Bellona **does not recommend that neighbouring EU Member States are consulted** on the award of exploration and production licence authorisations mainly due to the delay in authorisations this would occur. For the **emergency preparedness plan** it is a recommendation that **EMSA**, in addition to the national competent authority **authorizes** the plan.

Prevention of accidents

4. Please describe here any recommendations or changes (to the current regulatory framework or practices) - if any - that you consider important to improve the prevention of accidents affecting the health or safety of workers on offshore oil and gas installations in the EU:

Function requirements rather than a prescriptive approach

Safety requirements should not be static but rather **dynamic**; Instead of having a detailed legislation specifying methods to be applied ("do's and don'ts") the legislation should state results to be achieved and impose "**function requirements**".

Legally enacted safety requirements should define the **limits within which operational and management choices have to be made** and the relevant competent authority would supervise activities to ensure that these are carried out according to these limits. In the case of non-compliance, or if the choices made are not desirable (also not legally challengeable), the norm should be modified either through an amendment of regulation or through individual orders; With the effect that the operator in question is left with a more narrow window for manoeuvring and has to make new choices within the boundaries of the new requirements.

It should be **the operator`s responsibility** to prove that activities will be safe rather than relying on a regulator to prescribe and approve a series of fixed measures. Such an approach would better ensure safety as new technologies and methods, in always more risky environments, are applied. Such system should seek to place the responsibility for safety where it belongs – within the industry itself.

A function requirement approach **requires** however **1)** that the industry understands its **role in safety management** and is in a position to play its role properly and **2)** that the **competent authorities** are given the proper tools and **have the proper competence** to

exercise its control tasks. **Proper tools include 1) the right of insight** into the activities that are subject to control, **2) the right to interfere** with activities should the monitoring reveal failure by the operator to meet the permit conditions or the appropriate regulatory framework and **3)** the **right to take sanctions** in case of non-compliance, such sanctions can be revocation of licence, issuing of fines, halt in operation etc.

To properly fulfil its role, the competent authority needs **political autonomy** and needs to have sufficient resources, personnel, technical expertise and authority. The authority must also provide formal training specific to the inspection process and keep up with changing technology. **There is a need to avoid a situation where inspectors rely on industry representatives to explain the technology at a facility.**

Collaboration and communication are essential cornerstones in a function requirement approach.

To ensure safety, the **legislation should address** the following topics:

- ensure adequate and **regular training** of key engineering- and rig personnel
- require establishment of **routines** for maintenance of installation
- require establishment of a **decision making process**, also among contractors
- ensure that **information is not compartmentalized** and that it can be shared
- require procedures allowing to **communicate lessons** from earlier near-accidents
- Consider a **"go-stop-go system"** implying that certain milestones in the operations cannot be passed unless the controlling authority has positively concluded that relevant requirements are met

It should be noted that a HSE regulatory framework and **practices based solely on internal control should not be an option**. Internal control should be a supplement to the competent authority and its close follow-up[9].

Diluted accountability

Petroleum operations are mainly carried out by very large organisations. Particularly for large accidents, the accountability is centralized at the top of the organisation. These are often CEOs with the perspective of value creation and quarterly results, and are remote to the daily operation on site. At the other end of the organisation is the person who has to make the day-to-day decisions whether a risk exposure is acceptable or not. This person is

[9] This is not limited only to the HSE system, but applies (maybe even more so) the system of work processes linked to competence and Handling Deviations linked to Quality Improvement (ISO9000 terminology)

often subject to a significant pressure to choose the commercially more attractive option, and is really not accountable as a person - at this level accountability is carried by the "system", i.e. the procedures meaning that there is no accountability.

This **situation of "centralised accountability" is not satisfactory**. Instead systems similar to the one applying in hospitals should be investigated. The person "on site" would be accountable in the same manner as the physician and his personal **licence would be withdrawn if irresponsible decisions are taken**. This system assumes that a licence to practice a specific activity is issued by the competent authority. Several operations in petroleum industry have common characteristics with physician as in both cases their actions can result in loss of life. Risk levels are similar if not higher.

As Nassim Taleb, Professor of Risk Engineering, puts it in his ten principles (Financial Times 07.05.2009) *"Do not let someone making an "incentive" bonus manage a nuclear plant – or your financial risks. Odds are he would cut every corner on safety to show "profits" while claiming to be "conservative". Bonuses do not accommodate the hidden risks of blow-ups. It is the asymmetry of the bonus system that got us here. No incentives without disincentives: capitalism is about rewards and punishments, not just rewards"*[10].

Today's situation where **moderately trained personnel take decisions with potentially very large consequences and with limited personal consequences in the case of failure,** is a heritage from the "good old days" of the oil business, and is **not built upon reason**.

Mobile offshore units

The **discrimination between fixed and floating installations** that presently exist[11], is very much an artificial one, and is **long out-dated**. The distinction between sea-going and not sea going facility must be **replaced by a distinction based on the kind of operations carried out**.

I.e. **a facility which enters into a drilling operation or a well intervention operation must be subject to the same regulations then the one applying to fixed installations, even if the facility is classified as a ship**. The background for today's situation is partly the result of a long-standing conflict of interest - or even power struggle - between two regulatory areas, i.e. marine vs. petroleum, and is not based on reason. It is Bellona`s view that the regulatory framework as well as industry best practices are at a higher safety standard for fixed

[10] http://www.fooledbyrandomness.com/tenprinciples.pdf

[11] Directive 94/9/EC concerning equipment and protective systems intended for use in potentially explosive atmospheres,Directive 2006/42/EC of the European Parliament and of the Council on machinery, and amending Directive 95/16/EC, and Directive 97/23/EC of the European Parliament and of the Council on the approximation of the laws of the Member States concerning pressure equipment.

installations than for mobile sea-going vessels. By applying existing safety standards and regulatory framework to mobile sea-going vessels involved in petroleum exploration and production, much can be gained directly.

European standards

Tools more specific than BAT documents are needed to ensure that the requirements set by authorities are met. Standards are one of such concrete tool where the industry in cooperation with the authorities set the conditions for safe operations.

It could be considered to establish a European set of standards[12] for the offshore petroleum industry. The objective of such standards would be to replace companies own standards.

A European set of standards should:

- be based on recognized international standards with the addition of provisions deemed necessary to meet the needs of the European petroleum industry and fill in the gap in such international standards.
- be included as a branch of CEN[14] standards covering requirements to installed equipment, the monitoring and operations of these[15] (other than product standards covered by EN)
- evolve into a ISOSHELF which could include standards for risk management offshore, quality requirements for drilling plans, requirements for positioning systems, cleansing technologies, specifics with regards to climate/regions, condition monitoring etc.

5. *Please describe here any recommendations or changes (to the current regulatory framework or practices) – if any – that you consider important in order to better prevent damage to the natural environment from accidents on offshore oil and gas installations:*

[12] In 1993 Norway established a set of standards called NORSOK as a collaboration project between different actors in the petroleum industry and the authorities. The original purpose was to reduce implementation time and costs for construction and operation of petroleum installations on the Norwegian continental shelf, but has later been extended to *".. ensure adequate safety, value and cost for development and operation in the petroleum industry"* (http://www.standard.no/en/Sectors/Petroleum/NORSOK-procedures-and-templates/)

[14] http://www.cen.eu/cen/AboutUs/Pages/default.aspx

[15] Such as cement logging, environmental sediment sampling, underwater operations, fluid flow operation, lifeboat handling, sub-sea monitoring etc. Such standards will be closely linked to requirement for BAT in the directive 2011/22/EU

Bellona`s experience with offshore oil and gas activities on the Norwegian continental shelf is that most accidents, spills and near-accidents follow non-compliance with legislations.

With that being said some recommendations aiming to improve the existing regulatory framework on the Norwegian Shelf are included in this section. This section lists some of the most pressing non-existing requirements in the Norwegian regulatory framework.

Best available techniques and technologies

The definition of best available techniques are coded in Article 2 (12) of Directive 2008/1/EC[19] where the principle aims at reducing emissions and the impact on the environment as a whole[20]. A similar definition of best available technology in order to reduce risk in offshore petroleum activities should also be applied[21].

The oil and gas industry is an evolving industry continuously moving further into more complex subsurface structures (high temperatures, high pressures, sub-salt, compartmentalised reservoirs etc.) and more challenging external environments (weather, depth, access to infrastructure etc.)[22]. As technology evolves so must the technical capability of the companies and the associated regulatory framework. In order to embrace this, a requirement to apply existing and emerging BAT could be made. Such a requirement should also include to **test, qualify and pilot new technologies that have a potential to improve safety, aiming to use this technology on a permanent basis.**

Such a requirement also imposes some challenges. The current situation on the Norwegian Shelf when it comes to the application of BAT in a function based regulatory framework is that technology is defined (by oil and gas companies) as “not available”[23] and therefore not defined in the list of BAT. The definition of “available techniques” in 2008/1/EC Article 2 (12)

[19] Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (Codified version) (Text with EEA relevance)

[20] In order to determine BAT, the Commission publishes BAT reference documents http://eippcb.jrc.ec.europa.eu/reference/

[21] E.g. in the norwegian “HSE Framwork regulation” the BAT principle is included in section 11 “Risk reduction principles” (see guidelines regarding the Framework regulations under http://www.ptil.no/framework-hse/category408.html)

[22] As an example the oil province in the North Sea matures the drilling activity on the Norwegian Continental Shelf increases. The drilling activity on the NCS has never been higher than in 2010, and never before has as many HPHT (high pressure high temperature) wells been drilled.

[23] According to Directive 2008/1/EC Article 2(11) (b) "available techniques" means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator.

b) allows cost considerations to define "best available techniques". Most companies are in line with the definition by DNV (DNV RP-A203) where technology is defined on a scale from brand new to fully tested with an associated risk factor from 1 to 4.

In other words, companies have decision making procedures that associate the implementation of new technology with an increased risk factor and thus higher costs. There are few routines that include the potential to improve safety and performance when addressing implementation of new technology. In most cases it is individuals (enthusiasts) who have stressed the implementation of new emerging technology.

To achieve this without imposition **HSE demonstration and qualification programs**[24] could be used. The authorities or a consortium of industrial partners could fund a program aimed at qualification of new technology.

Challenges related to mature fields

Pressure depletion and pressure increase, particularly in heterogeneous and compartmentalized reservoirs impose an increasing challenge to mature fields.

The following event at the Gullfaks field is used here as a descriptive example of the need to **re-assess mature fields** in terms of changes in the sub-surface[25], bathymetric changes[26], abrasion of facilities and increased emissions to air and water[27]. BAT, which might not have been available when the original PDU was granted, should to a larger extent be implemented in the mature field production phase. Re-assessments of, and **changes to production plans, could be required** by the competent authority after a given volume of oil is produced or after a given time period.

Spring 2010 a pressure increase in the overburden at the Gullfaks field in the northern North Sea created severe problems while drilling an "ordinary" production well. This pressure increase and subsequent fracturing of certain intervals is a result of extensive and uncontrolled water injection, and was not reflected in reservoir simulation models for Gullfaks. Unexpected subsurface fluid and pressure migration led to a situation where

[24] E.g. an HSE program similar to the DEMO2000 program (http://www.demo2000.no/english.html)?
[25] pressure increase and/or depletion
[26] effects of petroleum production on the stability of the sea bottom
[27] produced water results from water injection and subsequent production and describes a mixture of water and oil with smaller amounts of radioactivity, traces of heavy metals, chemicals etc. (depending on the composition of water injected and the composition of brines in the formation). Increased CO_2 emissions are coupled with the increased energy consumption of injection processes. Increased recovery rates are most often associated with increasing volumes of produced water, increasing volumes of radioactive water, an increased use of chemicals and increasing CO_2 emissions.

decisions were being made on the basis of assumptions and models, not real-time observations. The failure to acknowledge small margins between fracture- and pore pressures coupled with irresponsible re-use of well/safety barriers with in-sufficient integrity caused one of the most serious near accidents on the NCS in years. As the Petroleum Safety Authority (PSA) wrote in its order[28] to Statoil *"Only chance averted a sub-surface blowout and/or explosion, and prevented the incident from developing into a major accident"*.

Even though the PSA stressed the need to deploy BAT for drilling[29] within narrow pressure-margins, both in planning and drilling phase, BAT was not adopted until a blow-out[30]/kick in the well late 2009. A "go-stop-go" system (see Q4) would more likely have prevented such a situation.

The lack of international standards for operations in the Arctic

Prior to drilling in any of the Arctic areas the standards for operating in these areas should be established and relevant existing standards should be revised. Sufficient international standards for the areas of operations (whether it is exploration or production) must be in place. An assessment of international standards for the oil and gas industry carried out by expert groups under a steering group comprised of Gazprom, Lukoil, DNV, Rostekregulirovanie, Rostechnadzor, Statoil and The Norwegian Standards Association (NSF) showed that almost half of the assessed standards (50 out of 101) were not applicable in the Arctic waters[31].

Subsea installations – lacking surveillance

---

[28] An order is an administrative decision made pursuant to the regulations. The notification of order and the order for the Gullfaks C case can be found under the link http://www.ptil.no/news/notification-of-order-to-statoil-gullfaks-c-article7409-79.html

[29] In this case MPD – Managed Pressure Drilling. Conventional drilling was chosen despite advice from PSA due to commercial terms

[30] Definition of blowout from the Schlumberger Oilfield Glossary: *"An uncontrolled flow of reservoir fluids into the wellbore, and sometimes catastrophically to the surface. A blowout may consist of salt water, oil, gas or a mixture of these. Blowouts occur in all types of exploration and production operations, not just during drilling operations. If reservoir fluids flow into another formation and do not flow to the surface, the result is called an underground blowout. If the well experiencing a blowout has significant openhole intervals, it is possible that the well will bridge over (or seal itself with rock fragments from collapsing formations) downhole and intervention efforts will be averted*".

[31] The report is called "Barents 2020: Assessment of international standards for safe exploration, production and transportation of oil and gas in the Barents Sea" and covers standards for electrical instruments, telecommunication, ship transportation, working environment, subsea technology, drilling, pipeline technology, process technology, lifting applications etc. Link to the report: http://viewer.zmags.com/publication/810da62a

There is a need for improved implementation of risk management and technology for surveillance and monitoring related to subsea installations[32]. Inadequate, and often non-existing surveillance and monitoring, result in an extremely delayed (if any) detection of leaks and spills from sub-sea installations. Underwater real-time sensors[33] must be mandatory for all subsea facilities and the area around them, so that leaks can be detected at an early stage. In addition down-hole instrumentation and pressure measurements and management are important in order to prevent leakages. Simulations and reporting of data in order to evaluate the long-term impact on the natural environment of leaks, using empirical historical data of a third party, should also be included.

The following examples are included to show that sufficient requirements for operation and monitoring[34] of subsea installations are not in place

1. **Leaks from sub-sea installations:** At least two subsea fields on the Norwegian Shelf (Tordis and Visund) have experienced accidental leaks from subsea disposal wells in the last 5 years[36].
2. **Detecting leaks:** Statoil's evaluation of the accident at Tordis in 2008[37] points out that the means of detecting a leak were *"only visual observation of the surface and ROV[38] inspection of installations on the seabed to detect emissions"* and concludes that clear improvements must be done when it comes to detection of emission on the seabed[39]. The report shows the need to evaluate methods and equipment to search for leaks on the seabed by e.g. evaluation of decompression, suitability of various vessels and special equipment and one of the recommendations are that *"the ROV with a multibeam echo sounder should be used to detect and map changes on the seabed. It should be ensured that such equipment is available for such operations"*.
3. In "The scientific basis for revising the integrated management of the marine environment of the Barents Sea and the sea areas off the Lofoten Islands" Von Quillfeldt, C.H. (Ed.) 2010:86[40] points out that ***"several of the larger unintended oil-***

---

[32] Sub-sea wells, riser base, manifold, pipelines
[33] acoustic and other geophysical sensors in addition to geochemical sensors
[34] both down-hole, flow-lines and in particular the external environment at and adjacent to subsea installations
[36] Prior to these several unintended spill from wells at the Åsgard subsea installation has also been experienced (from 1997 to 2001).
[37] Report no A EPN 2008-5 L1 and Presentation "FoilerTordis" provided on request from postboks@ptil.no (Petroleum Safety Authorities in Norway) with reference to LOV 2003-05-09 nr 31 (Environmental information act) and LOV-2006-05-19-16 (Information duty regulations)
[38] ed.note: Remotely operated vehicle
[39] e.g. improvements in terms of search pattern and priority
[40] Integrated Management of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands (management plan) http://www.regjeringen.no/en/dep/md/Selected-topics/hav--og-vannforvaltning/integrated-management-of-the-barents-sea.html?id=87148

spills have occurred at subsea installations" and specify that underwater leaks may be *"harder to detect than other leaks"*.

4. **Choice of equipment:** The report[41] also highlights that the choice of equipment affects the possibilities to supervise and monitor the injection process: *"The Xmas Tree (XT) and the well design is kept simple and …Consequently the XT system does not support down-hole instrumentation or down-hole safety valve that is also reflected in the Utsira drill cutting injection well for Snorre B"*.
5. **Associated risk:** For hydrocarbon spills defined as *"totally uncontrolled flow from deep zones"* in SINTEF's global database of blowouts (SINTEF 2008[42]) 41% of the blow-outs occurred during well completion and/or workover-operations. These operations are more demanding for subsea wells and hence there might be a need to address and treat the associated risk in specific consents for work-over operations on sub-sea wells
6. **Lacking standards on subsea installations with an FPSO:** Subsea installations without landing systems are producing using an FPSO, which in turn loads the oil and gas on tankers. Barents 2020 Phase 3: Table 4.5.5[43] points out that *"Norwegian Standard Procedures falls short on these aspects (Ed.note: subsea installations with an FPSO) in the Barents*".

Blind spots of the Machinery directive

One of the objectives of the Machinery Directive (2006/42/EC[44]) is to ensure the quality and integrity of hydrocarbon pressure-containing vessels (machinery). There are blind spots that are not covered. In particular this relate to the state of the machinery after entering into operation. Operational duty may involve loads and tensions that where not known at the time of design, and is therefore not incorporated into the sizing or design calculations. By virtue of a continuously developing technology and business this is bound to happen. For critical equipment the only way to mitigate this situation is by imposing strict requirements to instrumented monitoring and reporting. One example which serves to illustrate this situation is that on several occasions subsea wellheads have been (and still are) close to breaking due to materials fatigue resulting from well intervention operations. That is, vessels connecting to a well using an intervention riser which imposes cycles of large loads to the wellhead. There are likely many more such blind spots in the Machinery Directive.

---

[41] Report no A EPN 2008-5 L1

[42] http://www.sintef.no/home/Technology-and-Society/Safety-Research/Projects/SINTEF-Offshore-Blowout-Database/

[43] "Barents 2020: Assessment of international standards for safe exploration, production and transportation of oil and gas in the Barents Sea" http://viewer.zmags.com/publication/810da62a

[44] http://ec.europa.eu/enterprise/sectors/mechanical/machinery/

Monitoring the condition of the marine environment

To ensure prospective industrial operations operating companies and the competent regulatory authorities must have the means to observe and monitor the condition of the marine environment.

6. Improve compliance

6. Please describe here any recommendations you would like to make on how to improve compliance of the offshore oil and gas industry with applicable offshore safety legislation and other regulatory measures in the EU.

a) An important way to increase safety compliance is to **establish within the industry a strong safety culture**. Investigation made after the Deep Water Horizon Spill showed that BP, Halliburton and Transocean purposefully sacrificed safety for time and money and that many decisions resulted in cost savings.

Incentive schemes where employee receive a financial compensation for cutting costs and saving time should absolutely be prohibited when safety is compromised. Indeed, financial pressure bias decision making. Better safety management should on the contrary provide the implementation of reward and incentive systems, policies and procedures from the top of the organization on down in order to create a robust safety culture.

When assessing the compliance rate of companies to safety requirement, a distinction should be made between small and large incidents and between incidents to human health and damages to the environment. A ranking between incidents should also be made according to the extent of the damages occurred in such a way that a good rate of compliance for many small incidents would for example be offset by one more serious damage. The incentives systems and rewards established within the industry to ensure safety compliance would then have to be based on such accounting systems.

Guidelines for such ranking and accounting system could be provided to ensure a harmonized system across companies and be able to better assess companies compliance rates.

b) Better compliance can also be improved **through stricter administrative and criminal sanctions**: revocation of licence, usage of coercive fines, and halt in operation, but also penalties or imprisonment for wilful or negligent violations of safety requirements that have caused pollution damages or health damages. Criminal sanctions should not only be pronounced against individual physical person acting on the company's behalf (if applicable), but also against the company (in case of anonym negligence or cumulative negligence).

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

7. In your view, which are the key measures to supervise and verify compliance of the industry with offshore health, safety and environmental rules and who should do the supervision and verification?

Key measures to supervise and verify compliance of the industry include the following 1) audits with operations or planning of operations 2) investigations of operations or planned operations 3) consents at given milestones 4) regular and `on request` meetings with the industry 5) regular surveys covering relevant topics 6) professional seminars and 7) reporting systems where the industry report to the national competent authority e.g. daily activities (drilling, production etc.) and unexpected occurrences (accidents, leaks etc.).

The measures listed above should be performed by the competent national authority. It is desirable that the national competent authority is a safety authority whose sole focus is to ensure compliance with offshore health, safety and environmental rules[45].

The role of the competent safety authority should be to supervise all offshore operations; including 1) the recovery 2) processing 3) storage 4) offloading 5) piped conveyance of petroleum 6) diving and 7) decommissioning.

Go-stop-go system

To supervise and verify compliance, a "go-stop-go" system as described under question 4 could be introduced, implying that certain milestones in the operations cannot be passed unless the controlling authority, e.g. the PSA has positively concluded that relevant requirements are met. Such approach places the burden of proof on the industry, while the monitoring system implies that the authority itself has to pick up all relevant information and decide to act on this basis.

A prerequisite to supervise and verify compliance is to ensure that the competent authority has sufficient resources, personnel, technical expertise and authority. The authority must provide formal training specific to the inspections process and keep up with changing technology. There is a need to avoid situation where inspectors rely on industry representatives to explain the technology at a facility.

[45] E.g. in Denmark the Danish Energy Agency (DEA) is responsible for both administrating and supervising authorisation of licences in addition to supervising production and safety issues, whilst in Norway the Petroleum Safety Authority is regulatory authority for technical and operational safety and the Norwegian Petroleum Directorate has the objective of creating the greatest possible values for society from the oil and gas activities

8. In your view, should the existing environmental liability legislation (Directive 2004/35/EC) be extended to cover environmental damage to all marine waters under the jurisdiction of the EU Member States?

In our opinion, an extension of the territorial scope of the ELD (Environmental Liability Directive 2004/35/EC) so that it covers all marine waters under the jurisdiction of EU Member States (up to 200 or 370 nautical miles) and not only the territorial waters, would ensure better protection to the environment.

The ELD should also be modified so that it specifically includes offshore activities. Currently, it only covers environmental damages caused by airborne elements as far as they cause damage to water, land or protected species or natural habitat. This means that damages caused by offshore facilities and damages affecting only human health (and not the environment) do not impose liability on the operator.

9. In your view, is the current legislative framework sufficient for treating compensation or remedial claims for traditional damage caused by accidents on offshore installations? If not, how would you recommend improving it?

For damage to the local environment, the operator is liable under the Environmental Liability Directive 2004/35/EC (ELD) [46] as well as under national legislation for aspects not covered by the Directive and for damage to person or to property. Such national legislation have the potential to result in major costs for operators such as decontamination of land and water, reinstatements of habitats and species, compensation payment for victims of bodily injury or losses in property values. Those legislations have also the potential to draw in other responsible parties such as site owners and the producers of the harmful/dangerous substance. They also offer fewer defences against liabilities and generally do not contain the limitation periods included in the ELD.

The variation between the regimes of responsibility between member states is a factor of uncertainty not only for operators, but also for victims who might be better off claiming an action in one country rather than in another one. A more unified regime of liability would be welcome.

10. In your view what would be the best way(s) to make sure that the costs for remedying

[46] The ELD directive applies only in narrow circumstances and provides that liability is statute barred after 30 years

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

and compensating for the environmental damages of an oil spill are paid even if those costs exceed the financial capacity of the responsible party?

In Bellona's view the establishment of an EU or regional mutual trust funds alimented by operators[47] would be the best way to make sure that the costs for remedying and compensating for the environmental damages of an oil spill are paid (when these costs exceed the financial capacity of the responsible party). This fund would be similar to the International Oil Pollution Convention Fund or the UK's OPOL mechanism for the offshore sector (see comments in Q2 b) in this response) for further details regarding such Fund).

Transparency, sharing of information and state-of-the-art practices

11. ***What information on offshore oil and gas activities do you consider most important to make available to citizens and how?***

In line with the Aarhus Convention[48] an EU regulatory framework on offshore safety should include reporting obligations on safety, environmental issues; Including, but not exclusively, reporting and publication of unwanted events and human, technical and organisatorial causes for these. Investigations reports issues by the industry and competent authorities need to be publicly available following EU legislations on offshore safety.

The Commission, assisted by the Committee shall ensure that there is an appropriate exchange of technical and scientific information between Member States.

Information and statistics regarding the number and types of accidents causing damage to health, the environment, material damage, or events carrying a risk potential that could have led to an accident.

An impact assessment which describes the hydrocarbon developments expected impact on the environment, fisheries and society in general, is included in the development plan. This development plan should be distributed to interested parties and made available to citizens for commenting.

12. ***What is the most relevant information on offshore oil and gas activities that the offshore companies should in your view share with each other and/or with the regulators in order to improve offshore safety across the EU? How should it best be shared?***

[47] If the risks are deemed the same at any regulated site, a larger operator should cover a proportionately larger risk

[48] http://www.unece.org/env/pp/

1. Safety performance data

The most relevant information that offshore companies should share with each other and regulators are:

- Near accidents and corrective measures taken by the company
- Accidents and corrective measures taken by the company
- Statistic related to offshore safety; Number of leakages, human accidents, fires, unintended spills, loss of operation time, helicopter accidents etc.
- Risk potential associated with an accident, near-accident or undesired event: e.g. leaks, fires, unintended spills, well kicks, blow-outs, collisions with ships, human accidents, technical failures, loss of safety barriers etc.
- Conduct that affects, or has the potential to affect, the health or safety of members of the workforce at a facility
- Monitoring results from all parts of hydrocarbon production, - abnormal pressures, unexpected seismic anomalies, integrity data of installations, well integrity data (abandoned wells and well in operations)
- Results from environmental surveys
- Performance data on 1) events with risk potential 2) spills, discharges and emissions and 3) production related emissions and discharges
- Loss of safety barriers, - technical and organisatorial

Means must be taken in order to establish a common reporting routines and methods for these parameters.

2. Experiences from implementation of new technology

Experiences when implementing BAT on performance (both production performance and safety performance) and cost.

3. Exploration data

Release preparatory rights to exploration data like seismic, electromagnetic and gravimetric data after a defined time period; less than 10 years, in order to decrease the total acquired amount of this type of data and thus reducing the environmental impact of oil and gas exploration.

13. ***What information should the national regulators share with each other and how to improve offshore safety across the EU?***

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

In addition to the information included in the list under "Safety performance data" under Q12 in this response, the most relevant information that regulators should share with each other are

- Near accidents and corrective measures taken by both the company in question and the competent authority
- Accidents and corrective measures taken by both the company in question and the competent authority
- Risk potential associated with an accident, near-accident or undesired event: e.g. leaks, fires, unintended spills, well kicks, blow-outs, collisions with ships, human accidents, technical failures, loss of safety barriers etc. Both the risk potential reported by the companies and the risk evaluation performed by the national competent authority
- Industry performance data on 1) events with risk potential 2) spills, discharges and emissions and 3) production related emissions and discharges
- Loss of safety barriers, - technical and organisatorial; Causes, main events and measures taken by both the industry and the competent authority.
- Assessment by the competent national authority of company specific safety and environmental performance (on how a given company is performing in terms of accidents, maintenance, spills and operational discharges and emissions etc.).

Experience when implementing BAT

The Commission should organise and exchange of information from and between Member States and the organisations concerned on best available techniques. Experience with technology developments and implementation and risk developments should be shared.

14. ***Which means, if any, would you recommend using to promote, across the EU, the use of state of the art practices to protect occupational health and safety during offshore oil and gas operations?***

Meetings and common workshops

Safety forum meetings or other meeting platforms for representatives from the industry, regulators, relevant government bodies and interest organizations are crucial means to exchange information, best-practices, experience and new developments within occupational health and safety. Such forums should involve all member States, but separate meetings for regulators only are encouraged. Such forums should also look to experience with risk management in other relevant sectors to ensure state of the art practices. Meeting should be held on a regular meetings or following major events related safety issues.

Common workshops on selected themes could be organized by industry associations or engineering associations.

A common certification across the EU could also help to ensure state of the art practices to protect occupational health and safety (see also diluted accountability under Q4 in this response).

The Commission should publish statistics, reports and results related to HSE performance

Information and knowledge sharing is deemed crucial to improve HSE in offshore petroleum activities. The topic of information sharing is addressed in Q11, Q12 and Q13 in this response. A dedicated database of emissions and discharges in addition to a database on accidents and near-accidents (including their risk potential, consequence and measures taken) should be available for download on the Commission's web-pages. Reports and results related to HSE performance should also be published in order to protect occupational health and safety during offshore oil and gas operations.

Development of standards

A continuous update of existing industrial standards are necessary to meet the challenges the petroleum industry is facing; - not only in deep waters and/or in reservoirs with high pressure and high temperatures, but also in mature areas in terms of aging installations and a modified subsurface. The development of standards are addressed in Q10 (European standards) and Q5 (standards for operating in the Arctic) in this response.

15. ***Which means, if any, would you recommend using to promote, across the EU, the use of state of the art practices to protect the environment against accidents caused by offshore oil and gas operations?***

Promote knowledge sharing

Communication and knowledge sharing has proven difficult in the oil and gas industry. Successes are frequently communicated, whilst failures are toned down. On the Norwegian shelf more than 16 disposal wells have breached to the surface from around 600 meters depth, leaking chemicals, cuttings, heavy metals and hydrocarbons into the ocean and onto the ocean floor. The leaks and the causes for them[49] were not communicated, - not between

[49] Too high injection pressures, the use of materials like steel with insufficient integrity/quality, misjudgements related to subsurface properties and the lack of mitigation barriers like monitoring and supervisions of activities led to extensive fracturing and subsequent leaks at neighbouring platforms within the same

neighbouring platforms and more worry-some, not within the company, before several (>2-5) years after the leaks occurred. The lack of communication is believed to be one of the major causes that allowed these leaks to continue over more than 10 years[50].

Bellona encourages the EU to ensure transparency and communicate impact assessments, emission data, safety data, environmental impact data, production performance data and other relevant documents[51].

Promote monitoring

The other main concern in the example above is the lack of monitoring and surveillance of operations. Few of the leaking disposal wells had accurate pressure monitoring system and common for several are manual/visual pressure readings which were not evaluated or followed-up[52]. Also in the mentioned Gullfaks case (Q5 in this response) sufficient pressure reading equipment in the outer annulus was not installed. The lack of monitoring of subsea installations are covered in Q5 in this response. In general it is Bellona`s view that there should be a stronger focus on 1) Subsurface monitoring and sea-bottom monitoring and 2) Environmental monitoring (see previous responses in Q1, Q4 and Q5)

Emergency response and International activities

16. ***In your view what should be the role of the EU in emergency response to offshore oil and gas accidents within the EU?***

---

organization without the issue being communication, - neither between the platforms or to within the company.

[50] E.g. at the Veslefrikk platform in the Norwegian North Sea the disposal well leaked from 1997 until 2009 (see Investigation report (in Norwegian with English summary) or documents under PSA Journal 2009/1414). Following this leak, in February 2010, the Norwegian PSA told all operators on the Norwegian continental shelf with wells for injecting drill cuttings to report on their safety status (letter issues to all operators (in English)). The reports from the companies involved showed that 15-20 of these wells had leaked to the sea bottom at different times from the late 90s to 2010 (see reporting from Statoil and Exxon Mobile in PSAs journal «Informasjon om tiltak vedrørende brønner som injiserer kaks og andre driftsrelaterte fraksjoner» with appendices – correspondence date 23.03.2010).

[51] E.g. referring to the approach by EMSA to "..ensure, in particular, that the public and any interested party are rapidly given objective, reliable and easily understandable information with regard to its work" http://www.emsa.europa.eu/documents/emsa-publications.html

[52] "Vedlegg 1 – Kaksinjektorer" in PSAs journal «Informasjon om tiltak vedrørende brønner som injiserer kaks og andre driftsrelaterte fraksjoner» with appendices – correspondence date 23.03.2010 which can be obtained from PSA on postboks@ptil.no

A main recommendation from Bellona is to dimension an emergency response plan by impact and not probability. The size and scale of the emergency response must be based on the consequences of a given failure, not the probability of that event occurring.

It is important that legislation stimulates prevention and limitation of oil spills. The law must give operators economic incentives to carry out rational actions and not neglect such actions in fear of worst case juridical consequences for the operators. It is important that the international community through the IMO (International Maritime Organisation), the EU and the national governments co-operate to agree on solid and feasible solutions. It is mainly international conventions that regulate maritime damages such as oil spills from ships. When it comes to emissions from petroleum extraction, national laws are more relevant.

Decision-making tools for the protection of vulnerable areas and species should also be developed.

Build on EMSA

The role of the EU in emergency response to offshore petroleum accidents should be that of a coordinator with sufficient authority to mobilize a comprehensive response in a short time. Relevant national offshore emergency response teams responding to i.e. large spills should meet with, and plan response under the umbrella of, a coordinated EU initiative, and the recommendation from Bellona is to build on EMSA in order to achieve this.

As an example the emergency response after the Deepwater Horizon accident was handled by one organization, controlled by the US Coast Guard. A coordination of efforts proved essential for optimal management of the operation.

Transparency

Transparency of the emergency response plan and operation is crucial to the trust of the population. It is also important that not only the press, but
the local population, NGOs, interested professionals and researchers, developers and others represents of civil society is given the correct and updated information about the action, threats and updated analysis of the event and what the consequences might be.

Knowledge sharing and training of personnel

It is necessary to analyze the capacity and suitability of personnel and equipment for oil spill control. Exchange of knowledge about BAT in oil spill response is important for effective introduction of new technology and for planning the replacement of equipment in the paddock and on the installations.

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org

An important factor with regards to protection of health, ensuring an efficient organization and response, and obtaining an effective control/rehabilitation of contaminated areas is **education and training of personnel**.

17. ***Please describe any recommendations you may have concerning cooperation with non-EU countries to increase occupational safety and/or environmental protection in offshore oil and gas operations internationally?***

The EU should, in cooperation with nations bordering seas (North Sea, Mediterranean, and Black Seas etc) preset tasks in a major accident situation to minimize double capacity and improve opportunities for specialization of equipment, organization and personnel.

The recommendation is as in Q16 to build on EMSA in order:

- for relevant national offshore emergency response teams to meet with each others and plan emergency response under EMSA
- recommendation from Bellona is to build on EMSA in order to achieve this
- to establish common traffic monitoring in order to reduce the risk of ship colliding with installations
- to integrate ship safety, traffic monitoring and emergency spill preparedness for all ships in the oil and gas sector

18. ***Please describe here any recommendations you may have on how to incentivise oil and gas companies with headquarters in the EU to apply European offshore safety standards and practices in all their operations worldwide:***

High standards for equipment, personnel and organization in the EU area are helping to raise standards internationally.

It should be considered to develop a system as described in Q4 “Diluted accountability” in this response in order to withdraw a personal licence to operate if irresponsible decisions are taken (see Q4 for further descriptions). Such a system should also apply to operations abroad.

Bellona Europa aisbl
Rue du Trône 61
1050 Brussels
Belgium

Telephone: +32(0)2 648 31 22
Telefax: +32(0)2 646 81 22

Belgian organisation number
0458.243.836
www.bellona.org