Managing the risk of major accidents in a governance perspective

PETROLEUMSTILSYNET

Styring av storulykkesrisiko i et virksomhetsstyringsperspektiv

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1. Introduction

One of the tasks assigned to the Petroleum Safety Authority Norway (PSA) is to follow up to ensure that the players in the petroleum activities prevent incidents that can lead to major accidents and accidents that entail loss of life or serious personal injury, harm to the external environment and/or damage to financial assets. Through our audits and our investigations of serious incidents, as well as major industrial accidents on the international scene, we see that there are some recurring causal relations. One of these factors is management involvement at various levels, and how management influences factors that are important for the risk of major accidents. Therefore, in 2008 and 2009, the PSA has prioritised the follow-up of management's contribution to reducing the risk of major accidents.

The objective of the activity has been to gain insight into what information basis company management uses to maintain the necessary overview over the risk of major accidents the company is exposed to through its involvement on the Norwegian shelf, as well as the actions company management has implemented on this basis.

The PSA has also attempted to gain insight into factors linked to how company management communicates with the boards of directors, including any instructions from and reporting to the boards as regards the risk of major accidents.

This report sums up the PSA's overall assessments following the audit of the 11 companies targeted since 2008.

Management of major accident risk is relevant for the entire organisation of a company. This audit activity is limited to involvement at the company management level, and thus deals only with management of *some* of the factors that are of importance for the risk of major accidents. According to the petroleum regulations, each player has an independent responsibility when it comes to managing the risk of major accidents under Section 5 of the Framework Regulations, cf. Section 3 of the Management Regulations. The audit activity addresses involvement on the part of the company's management to ensure prudent operations, cf. e.g Sections 8 and 9 of the Framework Regulations and Chap. II of the Management Regulations.

For information purposes, please note that one of the PSA's main priorities in 2010 is also to address management's work to reduce the risk of major accidents, including:

- clarity in the distribution of responsibilities as regards preventing major accidents; at and between various levels of management, and at various levels in the player chain
- knowledge of and attention to major accident risk in the company's activities, including major accident risk associated with change processes
- capacity and competence in the organisation with regard to handling the risk of major accidents
- learning from serious incidents

- self-evaluation of the overall work to reduce the risk of major accidents

2. Execution

The PSA's audit targeted 11 companies with different roles and tasks. This was done to ensure that we covered a representative selection of the players on the Norwegian shelf. The activity was started in 2008 in relation to the following companies:

- ExxonMobil Exploration and Production Norway AS
- Det norske oljeselskap ASA
- Transocean
- Petoro AS
- Dolphin AS

In 2009, the PSA expanded the activity to include the following companies:

- Aker Solutions AS
- Lundin
- DONG
- Seadrill Norge AS
- Noreco
- ENI Norge AS

We held an initial meeting with the companies in which we explained the technical foundation and experiences that formed the basis for this supervisory activity. We presented our questions to the companies and requested a meeting so the companies could present information and evaluations to demonstrate that the companies:

- identify and evaluate relevant knowledge about the company's vulnerability in relation to major accidents, and put this information to use in the company's strategic choices, plans and daily decisions made by the company management
- exercise accountability for individuals in the company's management, and for management jointly as regards the importance of leadership for major accident risk;
- make decisions that, individually and jointly, do not come at the expense of the company's goal of having the lowest possible risk of major accidents
- assure themselves that the management's attention to reducing major accident risk has the desired effect

To the extent relevant, we also requested that the companies indicate the most important aspects of the above-mentioned items in which the board is also involved, and the manner in which this involvement is manifested vis-à-vis the companies.

In 2009, the five companies that were subject to the audit activity in 2008 were asked to present their evaluation of development and status in the same areas covered by the audit questions in 2008, in part with a point of departure in the items pointed out in the company-specific audit report and in the compiled report following the 2008 audit.

In separate four-hour meetings, each company gave a presentation explaining management of major accident risk at the company level. They explained how the company's management contributes in

practical terms to ensure that the company's goals and strategies are compatible with prevention of major accidents, given the particular context of the individual company. In light of the technical basis for the audit, the PSA asked questions to clarify the companies' own evaluations of the following areas, among others:

a) **Company management's evaluations and assumptions** with regard to

- what can influence the major accident risk the company is exposed to, including the company's own evaluation of, for example:
    - the processes, units and players that can have an impact on the major accident risk the company is exposed to
    - the framework conditions laid out by the company's surroundings and stakeholders, which could have positive or negative consequences for the company's goal of preventing major accidents
- the company's opportunity to exert influence on factors that impact the major accident risk the company is exposed to, including:
    - the framework conditions that are considered important to provide participants in the activities in order to avoid deterioration of critical barriers to prevent major accidents
- their own role and the role of others with regard to preventing major accidents
- uncertainty in assumptions and basis of information

b) **Company management's basis of information** so that it can follow up the risk of major accidents the company is exposed to, including the information management emphasises in order to obtain an impression of e.g.:

- the company's exposure to major accident risk for its overall involvement on the Norwegian shelf
- how the risk of major accidents evolves over time
- whether the major accident risk the company is exposed to is adapted to the company's goals and strategies
- whether and where actions are needed in order to reduce the company's exposure

c) **Company management's involvement** in following up the major accident risk the company is exposed to, including:

- the information the company management seeks and/or the initiatives it takes to assure itself that the company's adaptation to external framework conditions (oil price, foreign currency, environmental requirements, framework conditions for access to capital, contracts, etc.) does not lead to deterioration of safety-critical barriers
- the information the company management seeks and/or the initiatives it takes to assure itself that the company's strategic decisions (business development, merger, contract strategy, etc.) do not lead to deterioration of barriers that are critical for preventing major accidents
- the initiatives and/or follow-up the company management prioritises as regards maintaining the company's ability to avoid a major accident in its own operated activities
- the initiatives and/or follow-up the company management prioritises as regards contributing to avoiding a major accident in activities operated by others that are regarded as critical for the company's achievement of goals
- any improvement items the companies have identified based on their own evaluations

The PSA's activity emphasised gaining insight into the companies' own evaluations concerning the robustness of their assumptions, overview and actions aimed at preventing major accidents. This

methodical approach is based on the company's need to ensure that its efforts to prevent major accidents are consistent with the company's values, goals and strategies on the Norwegian shelf. Verification of the content of these presentations has not been a specific goal, but this audit activity will, along with the PSA's general supervision of the industry, form a basis for the agency's prioritizations and further follow-up of the companies.

3. Technical background

3.1 General information on the approach to factors that influence major accident risk

Analyses of major accidents in very different sectors and with very different direct causes exhibit several similarities as regards underlying causes. Among other things, the links between different processes and goals are under-estimated, including the safety-related consequences of cost reductions, organisational changes and incentive schemes.

This audit activity was limited to risk management as a basis for preventing major accidents. Our point of departure included ISO 31000:2009 and COSO ERM:2004, which describe internationally recognised principles for risk management and express the importance of context in risk management.

Our basis has also included the development in knowledge over the past ten years within the following theoretical approaches to major accidents:

- High reliability organisations; including emphasis on the organisations' attention to so-called weak signals of hazardous conditions and their approach to uncertainty, complexity, redundancy and learning.
- Resilience engineering; including emphasis on the connections between different processes, each of which alone is suitable, but which together can affect the organisation's ability to monitor, predict and interpret factors that are important for major accident risk.

A great deal of knowledge and experience is available today regarding how major accidents arise and what factors are important in preventing them. Development and use of knowledge is also essential in the efforts to prevent a major accident in the Norwegian petroleum activities.

3.2 Management at the company level

Investigation reports following undesirable incidents and major accidents, both nationally and internationally, point to the importance of management's role in preventing major accidents. Management at every level affects the risk the company is exposed to, e.g. through:

- the decisions they make
- how they assess the consequences of their own decisions
- how they balance various considerations in relation to each other
- what they pay attention to
- the information they request
- how they interpret information
- what kind of practical role models they are
- what they reward
- how they deal with unusual or unpleasant information

The term "management" itself is not unambiguous, and can entail a number of different functions and tasks, depending on whether one is talking about work management, technical management, process management, facility management, business area management, corporate management, etc. Expressions such as "responsibility rests with the line" may be too ambiguous to provide the necessary clarity with regard to:

- the risk the individual manager is accountable for,
- the information the individual manager needs to handle the risks he/she is accountable for
- how the individual manager handles the risks he/she is accountable for, given the manager's function in the organisation

Emphasis has therefore been placed on how the companies create clarity in risk ownership in various management functions, also at the company level.

Investigation of undesirable incidents and internal control activities in the companies rarely challenges company management's involvement vis-à-vis major accident risk. It is often only in the wake of major industrial accidents that the spotlight is aimed at the consequences of the company management's basic assumptions, basis of information and involvement. This is one of the reasons why this audit activity is limited to the company management's involvement in managing major accident risk. In this context our point of departure is, in part, the conclusions in the Baker report (2007)[1], with particular emphasis on the report's conclusions with regard to ”corporate oversight” and ”board oversight”, cf. pages 225-234 of the report.

What the Baker report addresses as best practice with regard to involvement by the board and the management in managing major accident risk emerges e.g. from the “Health and Safety Commission, October 2003, *Corporate Responsibility and Accountability for Occupational Health and Safety: A progress report on HSC/E initiatives and measures*, HSC/03/105” and “*Health* and Safety Executive, 2006, *Defining best practice in corporate occupational health and safety governance*, Research Report 506”. These documents are also included in the technical basis for this audit activity because:

- a board's involvement in relation to major accident risk can affect and/or reflect the company management's involvement in this context
- the licensees' responsibility to facilitate and ensure that the operator manages major accident risk in an adequate manner on behalf of the licensee group can be compared with the role of a board of directors vis-à-vis a company's management

3.3 The company management's assessments and assumptions

In many cases, investigations following major accidents reveal that, over time, the affected organisations were confronted with clear and repetitive symptoms of deterioration of safety-critical barriers. This information was not recognized as alarming and/or was not adequately handled. This challenges, among other things, the organisation's basic assumptions about what constitutes relevant information, how available information should be interpreted, what one supposes, assumes and takes for granted. These basic assumptions affect e.g. which information is granted most weight and how it is interpreted. Examples of assumptions that can be misleading include:

[1] The report of the BP U.S refineries independent safety review panel, January 2007,

- assumption that an overview of historical performance provides reliable information about risk, and that e.g. a decline in the number of incidents by itself is a reliable indicator of the robustness of barriers that are significant in preventing a major accident
- assumptions that the same mechanisms lead to both work incidents and major accidents, and that information about work incidents gives reliable information about major accident risk
- assumptions that information used as a basis for evaluating major accident risk is relevant, reliable, adequate and timely, with subsequent cementing of incorrect assumptions and under-estimation of uncertainty

Experience confirms that management of major accident risk is part of a continuous interplay between actions that permeate all the activities and are integrated in the way the management runs the activities, also at the company level. There are thus a number of decision processes that affect major accident risk, such as investments, procurement, long-term plans, budgets, stipulation of production targets, contracts, alliances, mergers, change processes, streamlining processes, access to new areas, etc. Established approaches, terms, structures, traditions, etc. can also impact what one supposes, assumes and takes for granted in decision processes. This can contribute to:

- a systematic under-estimation of uncertainty and the dynamic nature of risk, and consequently, inadequate safety margins in the technology, organisation and processes
- a systematic under-estimation of goal conflicts between different decisions and processes, and an exaggerated confidence at the company level that safety considerations in practice take precedence if goal conflicts arise
- a systematic under-estimation of a lot of available information that can provide early indications of deterioration of critical barriers against major accidents, such as information about operational regularity, down time, maintenance lags, operating costs, repair costs, loss costs, under-capacity, etc.

3.4 Information basis for controlling major accident risk

Risk management at a company level involves controlling risks which can threaten the company's goal achievement and strategies. Major accident risk includes respect for human, environmental and economic resources, but also represents operational risks, legal risks, threats to reputation, reporting risks, financial risks etc. Risk management on a company level includes managing major accident risk because it is a necessary strategic consideration. In this strategic context, the company management needs to address what major accident risk the company is willing to take in its activities on the Norwegian shelf, and ensure that the company manages this risk.

The company management will require information on the company's "state of health" to decide if the major accident risk the company is exposed to is prudent, in regards to both the duties following from the petroleum regulations and the company's goals and strategies. This information will be consistent with the information lower level management needs to manage the risks they are accountable for. It will also cover major accident risk across the company's involvement on the Norwegian shelf and be in a format fitting the management's needs and functions.

The role of management as regards risk management on a company level also includes evaluating circumstances outside the company's sphere which could influence the company's risk exposure and/or the company's preconditions for managing major accident risk. This could include fluctuations in the price of oil, level of activity, access to capital, access to expertise, framework conditions given

by the authorities or the parent company, etc. The company management can also make decisions to adapt to changes in the company's risk exposure and/or the company's preconditions for managing major accident risk. This can include mergers, restructuring, streamlining processes, cost reduction processes, changes in contract strategy or incentive schemes, etc. The management's need for information on the company's "state of health" therefore includes information on how changes in the company's environment and the company's adaptation to these changes influence the major accident risk the company is exposed to.

3.5 Company management involvement

Risk management involves, among other things, continuously using a large amount of information, connected to greater or lesser uncertainty, to make decisions and act with the necessary confidence to make sure that activities are safe in the short and long run. This applies to all levels, including the company level.

According to the HSC (2003) and HSE (2006)[2] management involvement can include the following:

- formally and officially expressing individual and collective responsibility as regards developing safety management in the organisation, and also draw up and explain the expectations to safety management on all levels of the organisation
- provide for the development of a suitable spectrum of leading and lagging indicators for both quantitative and qualitative factors, which gives a necessary overview of risk and the efficacy of risk management on the company level
- ensure that an incentive scheme is developed which provides a balance between rewarding achieved goals and risk management, thereby basing itself on both leading and lagging indicators
- communicate to the organisation how external factors can threaten the company's values and standards, and how the chosen strategy conforms with the company's values and standards
- create a open culture, legitimising drawing attention to conflicts between different considerations; and establish the necessary framework for finding solutions on the right level and which satisfy the company's values and standards
- take definite steps to verify that the information received about the company's major accident risk exposure is relevant, reliable, sufficient and timely
- take definite steps to verify the progress, implementation and effect of critical decisions or processes, including the verification of sufficient capacity and competence to safely implement such decisions or processes
- obtain independent evaluations of management involvement toward the company's major accident risk
- take ownership of major safety topics and act as ambassadors both internally (culture of openness, debates etc.) and externally (industry-wide initiatives to urge on important improvements)

[2] Health and Safety Commission, October 2003, *Corporate Responsibility and Accountability for Occupational Health and Safety: A progress report on HSC/E initiatives and measures*, HSC/03/105" and Health and Safety Executive, 2006, *Defining best practice in corporate occupational health and safety governance*, Research Report 506"

4. Evaluations

This chapter summarises the PSA's evaluations after the presentations and subsequent discussions with the 11 previously mentioned companies, with a basis in the technical foundations explained in chapter 3.

4.1 The companies' self-assessments

All of the companies have carried out a self-assessment based on the PSA's questions, in accordance with the purpose of the supervisory activity.

The companies have considered the PSA's questions to be relevant at the company level, and they have answered the questions in an open and clear way. The companies' presentations appeared to be consistent as seen from the individual company's character, context and challenges.

The companies' self-assessments were focused on the management's assumptions, information basis and processes relevant to major accident risk. It has also been made clear that the self-assessments were based on how a major accident on the Norwegian shelf could threaten the company's goals and strategies.

The companies have presented improvement items which they have identified based on their self-assessments and continual improvement processes on the company level in general. The presentations as a whole gave an overview of processes that can improve, among other things:

- consistency between the company's goals and strategies and the exposure to major accident risk,
- overview of risk exposure across the company's activities on the Norwegian shelf
- management of major accident risk anchored in the company's goals and strategies
- organisation of the management's role and influence on the company's risk exposure
- self-assessments

More specific examples of improvement items the companies themselves see the need for are rendered below.

4.2 The companies' evaluations and assumptions

The companies all recognise that a major accident in their own operations would have serious consequences for the company's goals and strategies.

Several contractors also point out that other serious incidences in their own operations, even if they are not covered by the major accident concept, would pose a grave threat to the company's goals and strategies.

Seven of the eleven companies this supervisory activity has focused on are licensees on the Norwegian shelf. These companies expressed that a major accident in partner-operated production licenses would pose a threat to the company's goal achievement and strategies; in some cases to their survival as a company.

The companies all express that a major accident in the Norwegian shelf, even in activities they do not share, would have repercussions for the whole industry and the development opportunities of the individual company. A major accident with multiple deaths or acute pollution are considered the worst-case scenarios.

Beyond the overall and thorough aversion toward the loss of human life as the result of a major accident, the loss of reputation and revenue are considered the most serious consequences.

4.2.1 Risk with company-level attention

Several companies have illustrated what a major accident could mean for the company's goals and strategies in internal documents, annual reports and external presentations. Several companies have also pointed out that this exposure is considered to be strategically suitable risk communication.

The companies taking part in the supervisory activity presented how major accident risk is part of risk management processes on the company level. One of the companies illustrated this in Figure 1.

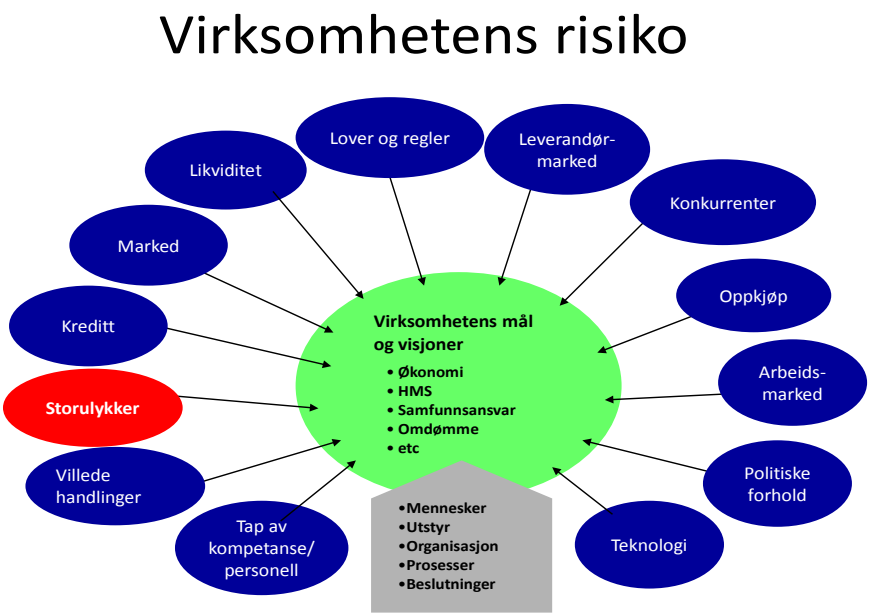

Figure 1: Illustration of risks that make up risk management processes on the company level

<figure text>

Enterprise risk
Statutes and regulations
Supplier market
Competitors
Acquisitions
Labour market
Political issues
Technology
Loss of competence/personnel
Misguided actions
Major accidents
Credit
Market
Liquidity

The enterprise's goals and visions
Economy
HSE
Social responsibility
Reputation
etc.

People
Equipment
Organisation
Processes
Decisions

4.2.2 Risk factors evaluated at a company level

The companies have also presented what they consider to be important factors influencing major accident risk, which they consider especially relevant for company management follow-up. All of the companies have given several examples of risk factors especially relevant to major accident risk.

Some companies have emphasised how they protect against what they deem important risk factors. Among other things, they state the importance of:

- established values and policies
- governing documentation and best practice
- contract strategy
- meeting structure and culture
- reporting structure and culture
- communication structure and culture
- competence and competence training
- organisation and manning
- inspection, verification and revision
- audits, analyses and studies
- different tools (risk analysis tools, SAP, Synergi etc.)
- risk monitoring

Other companies choose to emphasise the fact that internal processes and changes in central elements can influence the company's exposure to major accident risk. These can be:

- Acquisitions
- Long-term plans
- Budget
- Production goals
- Organisation
- Contracts
- Alliances
- Mergers
- Change processes
- Processes to improve efficiency
- Access to new areas
- Project development

In general, the companies' communicate in more detail about risk factors in the operative component of their activities and in less detail about risk factors in company-level processes. This could reflect the fact that the companies have much easier access to information on risk generated on installations/facilities than risk generated in management processes on the company level.

4.3 Company management's information base

The companies presented examples of the information they need for a satisfactory overview of the status and development of major accident risk on a company level. The companies presented examples

of both leading and lagging indicators used on the company level to monitor the status of safety critical barriers, both as single factors and linked factors.

Several companies stressed how they monitor the development of major accident risk in their activities on the Norwegian shelf, starting with lagging indicators based on the list of near-accidents (DFUs) in the PSA project "Trends in Risk Level – Norwegian Petroleum Industry" (RNNP).

This supervisory activity uncovered good examples of connected information considered relevant to give the management early indications of the condition of safety critical barriers, among others:

- total number of hours of outstanding maintenance per month, together with the average overtime for outstanding maintenance, the ratio of preventive and corrective maintenance, repair time per month on operations-critical equipment, repair time per month on safety-critical equipment
- management of change actions, together with outstanding actions after safety evaluations, revisions, inspections and studies
- number of variances from established competence training plans per month, together with overtime, number of hours of hot work class A per month and number of variations from company standards on work practice and HSE culture

Several companies express the need for improving the information base provided to management to evaluate major accident risk the company is exposed to across its activities on the Norwegian shelf. Examples have been provided for the need to improve, among other things:

- linking and processing available and relevant data toward relevant *information* on major accident risk
- quality-assurance of this information
- the balance of reactive and proactive information, needing greater weight on information yielding early indications of weathering on safety critical barriers, which will be better suited to prevent serious incidents and provide assurance towards the company's resiliency
- juxtaposing information to provide an adequate understanding of the company's major accident risk exposure across its involvement on the Norwegian shelf
- juxtaposing information on major accident risk and risk factors on the company level, adjusting it to the management's need and functions

The company presentations demonstrate that the companies estimate different needs for processing data and information from their own activities, ensuring that the information presented to company management suits its function and needs.

Some companies had established, or were in the process of establishing, more systematic processes to adjust the scope, detail and format of relevant information on major accident risk to different management functions in the company, including at the company management level. Other companies did not emphasise the need to differentiate major accident risk information on different levels of company management.

We have been presented with different practices on adjusting information toward the company management's function and needs, which could be natural, considering the companies' different organisations and operating contexts. After meetings with 11 different companies we see that companies sharing contexts will not necessarily have the same needs in this area.

The companies stressed that they continuously evaluate what information the management needs to fill its role in managing major accident risk. As mentioned above, several companies have identified the need for improvement in this area.

One common feature in the companies' presentations is that the company management's monitoring of major accident risk is mainly concerned with the technical and operational performance of installations/facilities. The technical and operational integrity of installations/facilities is a fundamental part of preventing major accidents, and is therefore highly relevant in monitoring the company's "state of health", including at the company level. As explained in Chapter 3 of this report, experience shows that information on technical and operational performance can be insufficient for providing a reliable or "early enough" picture of major accident risk. A unilateral focus on technical and operational performance can distract from other important (and available) information, found in processes and other circumstances outside of what directly happens on installations/facilities, and which can yield early indications of deterioration of safety critical barriers. Examples of such information is given, among other places, in Chapter 4.4.2.

In most cases, the companies' presentations are more precise on the information base used to monitor the development of major accident risk in their own activities, than monitoring the major accident risk the company is exposed to through participating in partner-operated activities.

We have been presented with different practices for monitoring the major accident risk the company is exposed to in partner-operated activities, which could be natural, considering the companies' different organisation and operational context. After meetings with 7 licensee companies, we can see that sharing an operational context does not necessarily mean sharing practices in this area.

The companies' continual improvement processes also address:

- the scope and relevance of information yielding *early* warnings of deterioration of safety-critical barriers, before said deterioration results in reduced technical and operational integrity on installations/facilities
- balancing the need for manageable information on the development of major accident risk across the company's involvement on the Norwegian shelf against the need for clarifying information as regards which challenges will need special attention

4.4 Company management involvement

All companies emphasised in their presentations the importance of the management's natural effort to prevent major accidents, and that company management can influence the company's exposure to major accident risk. They do this, among other things, through their decisions, their attention, clarity and consistency in demands and communication, what is rewarded, which values are emphasised etc.

All companies agree that company management's role and function indicate a need for special attention towards central *connections*. This includes connections between external conditions, management actions and major accident risk, for example:

- externally generated risks following change in the company's environment, such as changes in the price of oil, level of activity, access to capital, access to competence, framework conditions given by the authorities, licensees or the parent company, public opinion, alliances etc.
- how said changes can influence the company's ability to manage major accident risk and/or the company's vulnerability to major accidents
- how decisions to adapt the to its international, national and regional environment can influence safety critical barriers built into technology, operations, organisation, processes, capacity, competence, culture, structure etc.
- how the company's decisions can reduce the contractor's and the supplier's premises towards secure operations
- how the company's decisions as licensee can influence the operator's ability to operate responsibly and thus increase the company's exposure to risk.

The companies report self-assessments geared toward managing risks from the above mentioned connections, but report few experiences of independent assessments in this area and few initiatives to have independent studies.

4.4.1 Risk factors

In their presentations, the companies provided examples of conditions in their environment, which they believe to influence their ability to manage major accident risk, including:

- Changes in the level of activity on the Norwegian shelf influence the work tempo and the access to necessary capacity and competence, both with operators and contractors. A reduction in the level of activity as a result of the financial crisis could actually have a positive influence on risk.
- Changes in the industry structure on the Norwegian shelf is considered to have a number of consequences, including:
    - increased pressure on the access to competence and capacity, leading to decreased stability and continuity in manning
    - more difficult decision processes in production licenses because of increased variety in the companies' capacities and strategies
    - more limited follow-up of contractors.
- Some players report less openness from certain contractors in production licences. Changes in the player landscape and the Sarbanes Oxley Act are mentioned as possible causes.

- Some contractors pointed out that certain contract terms can challenge the operator's ability to fulfil their safety demands.
- The customer's adaptation to market changes and the aging of installations are considered important factors contributing to increased risk for contractors. Examples were given on jobs turned down because of high risk.

The company presentations emphasise how other players can influence their ability to manage major accident risk or their risk exposure. The companies do not elaborate to the same extent on how they themselves avoid influencing other players' ability to manage risk.

The companies have, through their presentations, presented examples of the management's specific involvement in following up major accident risk in the company's activities. Prominent examples were:

- budget processes including budget allocation for measures proposed with an argument emphasising the value of focusing on reduced major accident risk
- management meetings in connection with relevant contract processes
- management meetings including follow-up of activities on the installations, current projects, reported undesirable incidents, recruitment and training plans, nonconformity status etc.
- management visits on installations, yards and so on
- management meetings including the customer, supplier and partner
- management networking for the transfer of experience on best practice and/or the causal connections to serious incidents and accidents across organisational boundaries, company sphere or geographic lines.

The companies also present what they consider necessary to improve the management of major accident risk on the company level. This includes improvement of:

- communication on the status and development of major accident risk across organisational levels, along and outside of the line organisation
- communication on the status and development of major accident risk between players taking part in the company's activities
- follow-up processes of safety consequences of strategic decisions and change processes

As explained earlier, all of the companies expressed that the company management's role and function calls for special attention to central *connections*, both between the company and its environment, and between different processes in the company's activities. The companies have given specific and relevant examples of these connections and they report self-assessments directed towards managing risks involved in these connections. Several companies have identified the need for improving the management's information base used to monitor major accident risk. This will contribute to the companies' improvement processes, including:

- conditions in the company's environment which can influence the company's exposure to major accident risk in a positive or negative way
- decisions on the company level which can influence the company's exposure to major accident risk in a positive or negative way, including influencing the latitude for managing the risk in the company and with partners/contractors/suppliers the company relies on.

4.4.2 Distribution of responsibility in major accident risk management

The companies presented the principles for the distribution of responsibility across different management functions, how the personal and collective responsibility is expressed in company management and how the companies clarify the accountability of the individual management function vis-a-vis major accident risk management.

The companies' presentations differed in their emphasis on clarity in personal and collective responsibility towards managing major accident risk in company management. The same can be said for the presentation of the principles for dividing risk management responsibilities on lower levels of management, both in the line organisation and in support functions. Most of the presentations refer to the line responsibility. One company's presentation, however, was quite clear on:

- which specific functions regarding major accident risk management are assigned to the individual manager at the company level and the management group at the company level
- which principles are used to ensure that every manager at lower levels, in the line and in support functions, is aware of their responsibilities and the limits of their responsibility

Several companies confirmed they have reward schemes for managers who consider both results (rewarding historic performance) and what helps manage and develop their abilities to perform responsibly in the future (rewarding risk management).

As explained in Chapter 3 of this report, experience shows that confusion in risk ownership is causally connected to major accidents. Clarity in risk ownership is also a fundamental principle in recognised standards for risk management, such as ISO 31000:2009 and COSO ERM. The improvement items identified by the companies themselves, can clarify, among other things:

- the individual manager's risk accountabilities
- information the individual manager needs to manage the risks he/she is accountable for
- expectations for the individual manager regarding managing the risks he/she is accountable for, given the managers' function in management
- the suitability of reward schemes for promoting major accident risk management

4.4.3 Following up major accident risk in partner-operated production licences

Among the 11 companies included in this supervisory activity, seven play a licensee role. As previously mentioned in this report, these companies recognize that a major accident in partner-operated activities would be a threat to the company's goal achievement and in some cases their own survival.

These companies have presented how they size their follow-up of partner-operated operation licences, including based on a criticality assessment for the company's goal achievement and strategies. The companies have also presented the information they base themselves on to manage major accident risk in partner-operated production licences; as an integral part of the information base deemed necessary to evaluate if the company's exposure to major accident risk is acceptable, as a whole.

The companies playing a licensee role have given examples of how they get involved in reducing major accident risk in production licences critical to their goal achievement and strategies. It could be taking initiatives such as:

- internal studies

- risk analyses
- system audits in cooperation with other licensees to follow-up operator processes critical to major accident risk
- management reviews following serious incidents
- requesting information from the operator to follow up risk connected to change processes, implementation of improvement measures, etc.

Juxtaposing presentations by companies playing a licensee role yields few indications of an established consensus across partners in production licenses regarding what information is expected from the operator to give the licensees an overview of major accident risk and its development over time. The presentations indicated this is not an issue among licensees.

Several companies experience operators being restrictive on information to licensees. No companies report any structural limitations in conditions on production licenses, voting rules, player composition, share distribution, etc., which could hinder access to information essential to mapping out risk exposure.

Some companies downplay their influence in production licenses and point to other companies' decision-making. Other companies emphasise presenting specific initiatives and tactical moves to compensate for the lack of clarity and other challenges associated with decision processes in production licenses. These companies' presentations point out how other players can influence their ability to manage major accident risk or their risk exposure. These companies do not express to the same extent how they themselves avoid influencing other companies' ability to manage risk.

Several companies have reported that they recognise the need for improving their own involvement in partner-operated production licenses. Examples include competence training within risk management in general and major accident risk management in particular, directed toward, among other things, personnel following up partner-operated production licenses. Other examples of improvement areas the companies deem necessary include:

- more proactive involvement vis-à-vis major accident risk in critical production licenses
- better involvement *after* serious incidents in production licenses, which better addresses the underlying causes, especially management involvement with the operator
- major accident risk involvement adapted to both the licensee's and the operator's role and needs
- major accident risk involvement which better communicates to the operator and other licensees the common need for safeguarding the ability to create value
- better communication with the operator on information needs to fulfil the role of licensee
- following up safety related consequences of decisions and processes in the licensee group
- better transfer of experience from operator follow-up across licenses
- more active learning from serious incidents across licenses
- more active cooperation between licensees with larger shares and/or who would be the most affected by a major accident

These improvement items contribute to safeguarding the companies' interests and duties as a licensee following from the HSE regulations regarding:

- facilitating that decisions in the licensee group give the operator satisfactory framework conditions to prevent, among other things, major accidents
- verifying the operator's prevention of major accidents on behalf of the licensees

4.4.4 Risk communication

This supervisory activity challenges the companies' traditional communication around major accident risk management for several reasons, including:

- it points to consistency between the company's goals and strategies and their exposure to major accident risk,
- it points to the company's own need for risk management and self-motivated focus on major accident risk management
- it points to the company's collected activities on the Norwegian shelf
- it is limited to the management's role and its influence on the company's risk exposure
- it points to the company's self-assessments and self-defined improvement processes

All of the companies regard the resiliency of the company vis-à-vis preventing major accidents as being inextricably linked to the company's "state of health" and as an expression of the robustness of central preconditions for the company to reach their goals.

The companies have also illustrated how communication on the company's major accident risk management can present an *opportunity* to strengthen the company's competitive position.

Several companies regard information on the company's major accident risk management as being relevant information for, among others, owners, investors, clients, society at large and something the companies can gain from actively communicating. The companies' annual reports, however, reflect variations in what communication the companies feel is required or serves their purpose, such as:

- the company's exposure to major accident risk
- the company's risk management and its effects
- the board's interest and involvement in the area

Several companies confirm that the Sarbanes Oxley Act and corresponding initiatives have contributed to extensive reviews and improvements of the companies' management systems in recent years. The companies' presentations have not dealt with the effect of these changes vis-à-vis the companies' exposure to major accident risk and consequences for their major accident risk management.

Several companies consider the market changes occurring in 2008 to have the possibility to increase the companies' need to improve risk management and the stakeholders' need for information on the companies' risk management. The companies have not explained whether this increases the need for communication on their improvement processes vis-à-vis major accident risk management