

Integration of Radiation Protection in HES Management Practices and experiences in Statoil

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1 INTRODUCTION

Statoil is an integrated oil and gas company owned 100% by the Norwegian government. The general assembly of Statoil is the Minister for Oil and Energy.

The company has a very brief history in the oil and gas family. It was founded in 1972 and has over the passed 26 years grown to be a company with 17000 employees and business in 27 countries. Statoils business includes exploration and production, transportation, refining and marketing of petroleum and petroleum- derived products. Net operating revenue was NOK 125 billion (equal to some GBP 10 billion).

Statoil is one of the world's largest net sellers of crude oil and ranks as the biggest retailer of petrol and other oil products in Scandinavia.

Statoil is number 6 on the ranking list of the world's oil and gas companies as far as oil and gas reserves are concerned.

International activities are growing more and more important to Statoil as reserves on the Norwegian Continental Shelf are exploited.

2 ABBREVIATIONS, ETC.

HES:	Health, the Environment and Safety
NPD:	Norwegian Petroleum Directorate
NRPA:	Norwegian Radiation Protection Authority
Licensee:	Company or group of companies given a permit by the authorities to perform exploration and production of petroleum

3 QUALITY MANAGEMENT IN STATOIL

Statoil has established a quality management system to ensure that acts and regulations laid down by the authorities as well as Statoils objectives and goals are complied with.

In addition the quality management system consists of the following elements relevant to radiation protection:

Steering documents:

“Goals, values and management policy” named “We in Statoil”

Corporate steering documents on management, economy, health, safety and the environment (HES), personnel and organisation etc.

Area steering documents, e.g. valid for the Norwegian Continental Shelf

Requirements and guidelines valid for a factory or a platform

Personnel qualifications:

radiation protection courses/certificates for radiation protection officers
radiation protection courses for HES personnel in Statoil

Emergency contingency:

training
exercises

Audits:

performed by the authorities
performed by Statoil, including peer review and design review
inspections of vessels and equipment

Contracts:

HES requirements in contracts
contractor's requirements to subcontractors

4 HEALTH, THE ENVIRONMENT AND SAFETY: OBJECTIVES AND STRATEGY

The management of radiation protection is a part of Statoils general HES management system.

Statoil is proud of its achievement as far as health, the environment and safety is concerned. For many years excellent HES results have been regarded very important to Statoil, at least as important as economic results. Consequently Statoil have made strong efforts to reduce losses. For example, lost-time injuries have been reduced from 25 cases per million working hours in 1987 to below 4 in 1996. Unfortunately, Statoil has also suffered serious accidents.

Statoil's vision towards the end of the century is to be one of the leading companies, ie, world class companies, in our industry on Health, the Environment and Safety.

Since we know that many of the world's leading oil and gas companies have given high priority to HES, we consider this goal to be difficult to reach.

Statoil's objectives for health, the environment and safety are, quoted from our HES poster:

A high performance in health, environmental protection and safety is a self standing value. A high and efficient performance is also a prerequisite for our competitiveness.

Our objective is: zero accidents, injuries and losses.
We will contribute to sustainable development.
The same attitude apply everywhere we do business.
We expect our suppliers and partners to meet our HES standards.

A fundamental aspect of HES is that good HES results can be achieved through systematic efforts. To say "accidents come and go" is not allowed in our company.

The "Zero mindset"- philosophy recently laid down by our Top Management shall mean that all accidents, all injuries, all material losses and all unwanted releases should be Zero, ie, avoided. All such incidents are deviations and must be treated as such with investigations and critical questions from the management.

Best class companies have demonstrated over many years that it is possible to operate close to zero as far as unwanted incidents are concerned.

As a part of the strategy to reach the HES objective Statoil has introduced the benchmarking technique. A running project will collect HES data from 10 world class companies on HES measuring the following eight HES parameters:

fatalities
lost time injury frequency
total recordable injury frequency
sick leave
work related sick leave
releases of carbon dioxide
energy efficiency
waste treatment

One reason for launching the benchmarking improvement programme is to ensure a continuous management focus on HES. One slogan is: "What is measured will be done!" Hence the HES results are always number one on any status report to the management.

Additionally a self assessment programme is put into force. All units in the company are asked to judge themselves on a scale from one to six. The self assessment system include the following 14 elements:

1. general assessment
2. leadership and commitment
3. involvement and commitment by all
4. attitudes and behaviour
5. customer relations, external communication and co-operation
6. training and expertise
7. risk assessment and management
8. day-to-day operation
9. use of suppliers
10. engineering, technology and product development
11. emergency response
12. monitoring and measuring
13. internal control and monitoring
14. information technology and documentation

The self assessment system is introduced as part of the HES strategy to draw more attention to HES.

Three attitude levels are used:

HES on the paper, meaning that HES is characterised by requirements and guidelines.

HES in the head. Typical for this level is that the organisation have acquired insight and knowledge and are able to assess risk.

HES in the heart will mean that HES has become a natural part of all business and is regarded as part of the corporate culture.

I regret to say that the ALARA principle, which the radiation protection profession should be proud of having developed, is not specifically mentioned in the HES strategy in the petroleum industry. However, risk analysis as developed by the nuclear industry, is commonly used. I also dare to say that Statoil is a leading company in the application of risk analysis as a tool for HES improvement. The risk for fatalities, pollution and material damage is quantified and continuously evaluated.

Quantitative risk analysis is required by the authorities for offshore installations and is coming more and more for onshore industry.

It would be fair to say that the fatality risk should be kept as low as is reasonably achievable.

5 MANAGEMENT OF HES

5.1 Acts and Regulations

The petroleum activities on the Norwegian continental shelf are regulated by the Norwegian Petroleum Directorate (NPD).

One basic principle laid down by the NPD is the principle of internal control meaning that the Licensee (oil company) shall establish a **management system** to ensure that all authority requirements as well as the licensee's objectives are fulfilled as far as HES is concerned.

The regulations laid down by the Directorate are developing in the direction of **function** requirements more than **specific** requirements. This means that it is left to the Licensee to establish detailed internal rules to comply with the general paragraphs of the regulations. The NPD will through audits check that there is an unbroken line from the authorities' general requirements through the general HES principles or objectives of the Licensee to the specific and often detailed processes taking place wherever the companies may have activities.

In this context there is a difference between the NPD's regulation regime and the (very) detailed regulations laid down by the Norwegian Radiation Protection Authority (NRPA).

The NPD require that the management system of an oil company shall contain an overview of and have references to all relevant rules and regulations issued by the authorities. This requirement will ensure that the radiation protection legislation is taken into account.

5.2 Statoil's management system for HES

Statoil has established a management system according to the requirements of the ISO 9000 series. Again, one important principle is that there is a link from the general requirements to the detailed procedures being valid for one offshore platform or an onshore factory, or for a single process. This is however easier to specify on paper than to materialise in reality! Audit comments from the NPD very often show this fact!

5.3 Contractors

Statoil will continuously employ a great number of contractors both in operation and project development. In operation some contracts will provide contractor personnel to work alongside Statoil personnel in the day to day work. From a HES point of view it is then very important to consider this an **integrated team** where the same HES requirements and sound attitude shall apply. Therefore when accidents or unwanted incidents are reported, contractor personnel is included.

In addition suppliers or contractors performing a bigger job for Statoil at their own premises will have to report accidents or serious unwanted incidents to Statoil. Near misses with serious potential shall also be reported. The point is to focus on safety and introduce measures before a critical situation develops into an accident.

It is a general HES philosophy in Statoil that "We expect our suppliers and partners to meet our HES standards" This means that we want our contractors to adopt the "zero mindset". When selecting suppliers or renewing contracts, weight should be given to the results they have achieved in the HES field.

In the contractual strategy Statoil has established HES requirements to be laid down in contracts. This requirement will when relevant include radiation protection.

6 SOURCES OF RADIATION

The use of ionising radiation in Statoil's activities could be listed as follows:

- sealed radioactive sources, eg, level gauges, density gauges etc, in factories like refineries, petrochemical plants etc..
- radiography in construction or maintenance
- radiography during pipe-laying
- hyperbaric welding, mainly when repairing pipelines
- neutron- or gamma ray sources for well-logging
- miscellaneous uses like smoke detectors, beta-lights, portable level gauges etc.

Scale formation with low level specific activity is an example of radiation as an unwanted by-product discussed under another session of this workshop.

7 RADIATION PROTECTION MANAGEMENT

7.1 Radiation protection in statutory requirements

In the acts and regulations issued by NPD radiation protection is not mentioned specifically. In the process of simplification of statutory requirements the radiation protection area is referred to and covered by the “Act relating to the use of X-rays and radium” etc, which is regulating safe use of radiation sources and equipment in Norway. This Act is the basis for a set of regulations issued by the Norwegian Radiation Protection Authority on behalf of the Ministry of Health and Social Affairs in Norway. As earlier mentioned the radiation protection regulations are fairly specific and detailed. Hence the use of for instance sealed sources, industrial radiography, well logging sources etc, are covered by different regulations or guidelines from the NRPA.

The limitation of doses to personnel is regulated under the Act of 1977 relating to worker protection and working environment. This regulation is administered by the Labour inspection and not by the NRPA. However, the recommendations from the International Commission on Radiological Protection (ICRP) are taken into account through the NRPA.

Mobile platforms for exploration drilling and barges for laying of pipelines are regarded as ships and shall operate in accordance with the Act of 1903 relating to Public Control of Seaworthiness of Ships etc, with regulations pursuant to this act relating to radiation equipment. However, when such installations are used for petroleum activities, ie, they are not under transport or not in use, the Act relating to Petroleum activities will enter into force.

In general, Acts or regulations issued by different authorities will, when radiation sources are concerned, merge into the set of regulations or guidelines issued by the NRPA.

7.2 Radiation protection in company steering documents

In the following table is described briefly contents of radiation protection in steering documents in Statoils quality management system.

Document	Valid for	Contents on radiation protection
HES Policy / HES Poster CEO's statement	Statoil Group, World Wide	N/A
Corporate HES Policy	Statoil Group, WW	N/A
Management of HES	Statoil Group, WW	Radiation protection not mentioned
HES Requirements & Procedures (KP-02)	Norwegian Continental Shelf	Requirements for the use of ionising radiation referring to NRPA's guidelines
International HES Strategy	International Upstream Activities.	Reference to statutory requirements of the country in question
Technical & Operational Descriptions	Offshore activities, Norwegian Continental Shelf	Procedures for safe use, handling and storage of radiation sources including LSA
Procedures	Factory, installation	Specific procedures for the relevant application of radiation

In addition to the documents referred to in the table, the emergency preparedness documents will contain requirements for immediate response, emergency equipment, notification to relevant authorities etc, when activities involve the use of radiation equipment. The effectiveness of emergency plans are tested through exercises.

7.3 Radiation protection in contracts

The contract is a very important document for a company like Statoil. The contracts regulate not only the legal and economic relation between the company and its contractors, but also HES related matters including radiation protection. Normally the contract is a brief document. The working conditions, technical requirements etc. are described in underlying documents. Such documents may be Statoils general requirements like those referred to in the table above or it may be documentation prepared by the contractor or its subcontractors. Such documentation will always have to be approved by Statoil.

Below is described how radiation protection is regulated in the contract of installing the 700 km 42" diameter gas pipeline from the Åsgard field located some 200 km off the coast of Mid Norway to the gas terminal at Karstoe in the Stavanger area.

Company	Documents	Contents regarding radiation protection
Statoil	Statoils requirements on HES incl. radiation protection	See table above
Contractor	Contract	Nothing
	Project HES Plan	General radiation prot.
	NDE Safety Plan	Requiring safety documents to be prepared by subcontractor
Subcontractor	Radiation safety procedures	Detailed description of radiation safety, controlled areas, dosimetry, inspection, weekly radiation reports etc.
	NRPA Audit report	Report from NRPA covering radiation safety on board the lay-barge.

It should be noted that the latest generation of pipe-laying vessels are equipped with ultrasonic equipment for weld inspection. From a radiation protection point of view this is a step in the right direction.

8 CONCLUSIONS

Audit reports from the Norwegian Petroleum Directorate and the Norwegian Radiation Protection Authority indicate that the radiation safety during the use of radiation equipment on installations in the North Sea is generally satisfactory. The frequency of incidents involving radioactivity is low, and no incident has so far resulted in significant radiation doses to people.

From Statoils point of view radiation protection is well managed. In general, radiation protection is impressively well documented by the different contractors.

However, the zero mindset and the ALARA principle shall apply and there is always room for improvement. There is very high management attention on HES in Statoil. If you ask me about the most important areas for improvement efforts, I would list the following:

- educating and training key personnel on radiation protection
- emergency training e.g. by making radiation a part of major exercises
- improving management attention to specifically cover radiation protection