OIL & GAS

Offshore safety European regulation

The role of the independent verifier

Fabio M. Lo Brutto

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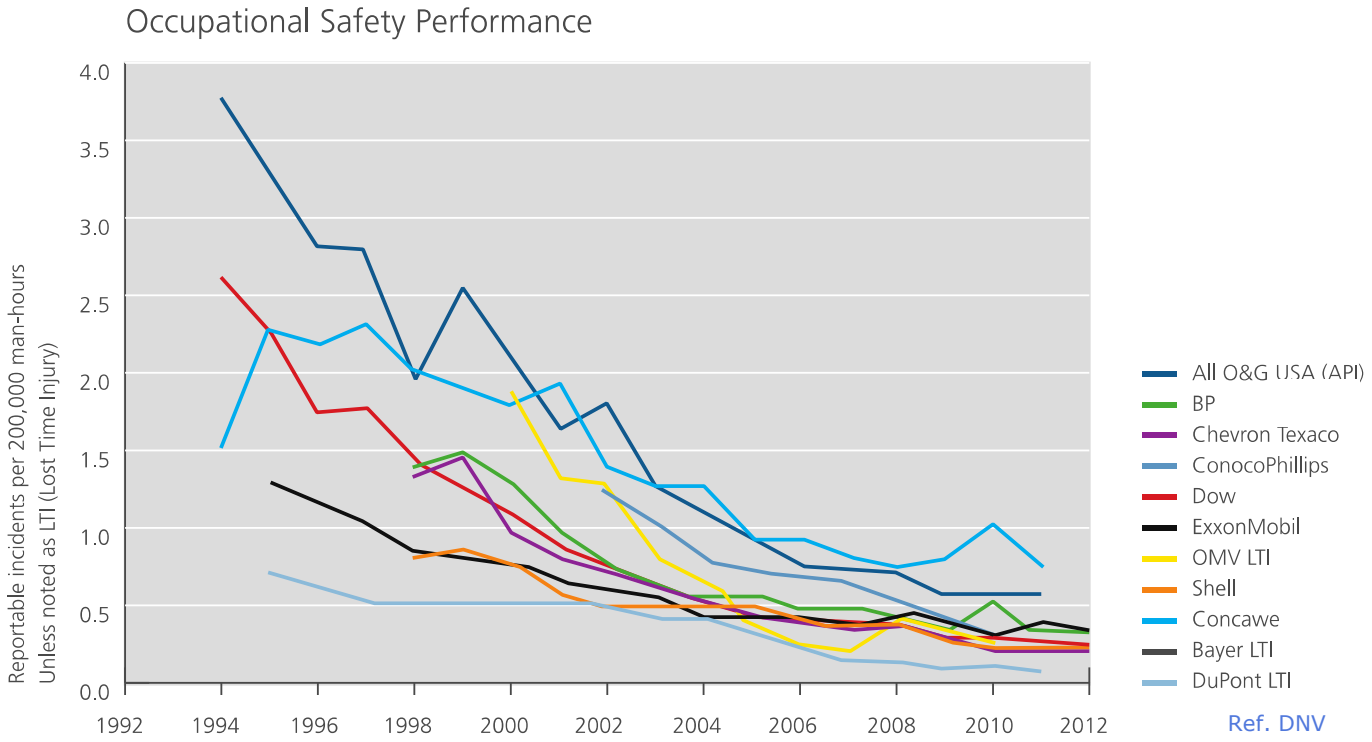
Presentation Outline

- Offshore industry safety performance: The drivers for the EU Directive
- Key elements of the new directive
- The independent verifier
  - What is verification and what is difference between verification and certification and classification
  - What types of verification services, examples
  - How to perform independent verification
  - Risk Based Verification
- A moment of reflection

Occupational safety has improved by a factor of 10

- Over the last 20 years the offshore and onshore oil & gas industries have achieved a step change improvement in occupational safety.
- Occupational safety is consistently measured, and receives senior management attention and commitment

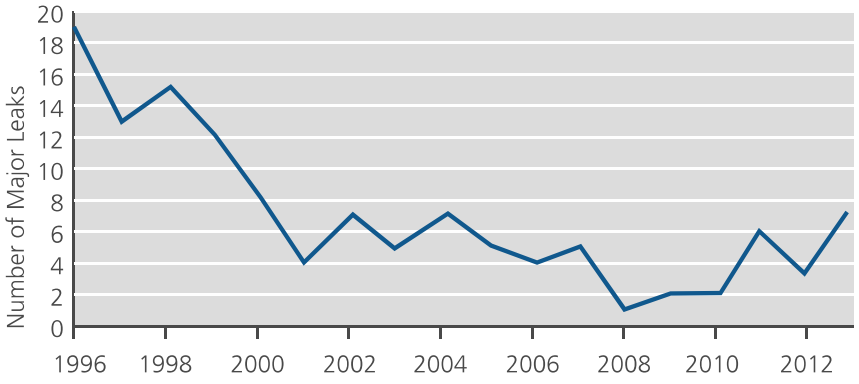


The risk of major accidents is decreasing, but not to the same degree

Positive development in several regions

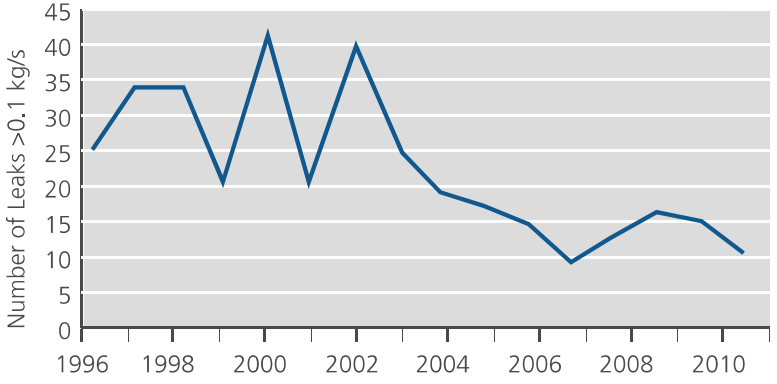
- No major disaster, accident or spill, since introduction of Safety Case in the UK and risk based legislation in Norway, but there have been near misses
- Offshore leaks are a significant cause for major accidents, and are a key leading indicator, but there is a lack of common leading indicators
- Senior management attention not always apparent
- Some recent causes for concern

UK North Sea Major Leak Trends



Source: UK HSE HCRD Dataset

Norway: North Sea Hydrocarbon Leak Trends



Source: PSA Trends in Risk level Summary report 2011

Offshore Safety & Environmental Performance

- We are facing a loss of confidence in the industry, with significant stakeholder concerns.
- Several severe incidents and accidents in the last few years contribute to this view
  - Montara blowout in Australia (2009)
  - Macondo blowout Gulf of Mexico (2010)
  - Aban Pearl semi lost offshore Venezuela (2010)
  - Elgin Gas Leak North Sea (2012)
- New EU Offshore Safety Directive introduced to bring "North Sea" best practices into force across Europe.
- Many EU countries will experience incremental changes to existing regimes, but for a some EU countries, change will be substantial.

Events That Shaped the European Response

Macondo

- Blowout
- 20 April 2010
- 11 Fatalities
- Gulf of Mexico
- Operator: BP/Transocean
- Oil Spill: 87 days
- Estimated oil discharged: 780,000 m3
- Fines: over $4.5 billion
- Costs to BP over $42 Billion to date

Montara

- Blowout
- 21 August 2009
- Coast of Western Australia
- Operator: PTTEP Australasia
- Oil Spill: 74 days
- Estimated oil discharged: 34,000 m3
- Fine: over $500,000

Who Will it Cover?

DIRECTIVE - STATES & INDUSTRY TO IMPLEMENT

- Offshore operations only
  - Directive 92/91/EEC to cover onshore development
  - DNV were engaged to review 92/91/EEC

- Offshore Installations covered:
  - New and Existing
  - Fixed and Floating
  - Production and Non Production

"Installation means a stationary, fixed or mobile facility, or a combination of facilities permanently inter-connected by bridges or other structures, used for offshore oil and gas operations or in connection with such operations. Installations include mobile offshore drilling units only when they are stationed in offshore waters for drilling, production or other activities associated with offshore oil and gas operations"

What Does it Require?

DIRECTIVE - STATES & INDUSTRY IMPLEMENTATION

- Closely follows the UK North Sea Safety Case Regulations
- More focus on Environmental Protection
- Independent verification extended to cover both Safety & Environmentally Critical Elements
- Additional requirements for Public Consultation – also for Drilling Operations
- Operators of Non Production facilities to submit and gain acceptance from the CA before commencing operations
- Well operations undertaken only by installation with an accepted Major Hazard Report
- Independent well examination before commencement
- Separation of Responsibility
  - Licencing
  - Safety/Environmental Regulatory Competent Authority
- Directive – Each member state may implement it in different ways

What Does It Require? New Duties On Operators

- Take all measures to prevent major accidents – Including escape of HC to the Environment
- Limit major accident consequences and have Emergency Response Plans
  - Considering the whole life cycle of installation – Decommissioning phase also required
- Prepare a corporate Major Accident Prevention Policy (MAPP) and a Safety & Environmental Management System (SEMS)
- Produce a Major Hazard Report covering both safety & environmental hazards
- **Independent verification of Wells and both SCEs & ECEs – Including planning of material changes**
- Suspend work if there is an immediate danger to human health or significant risk to the environment
- Notify well and combined operations -Submit Well Operation Notification before well ops – Including analysis of oil spill response effectiveness
- Demonstrate to the CA sufficient financial and technical provision to cover liabilities from a major accident

WHAT Does It Require? Focus On The IVB

"Independent Verification means an assessment and confirmation on the validity of particular written statements by an entity or organisational part of the operator or the owner of the non-production installation that is not under the control of or influenced by, the entity or organisational part using the statement."

INDEPENDENT VERIFIER BODY (IVB)

- Verifier role must be described in the SEMS
- The IVB is to provide independent assurance of Design, Operation, Examination, Testing of SCEs and ECEs (as defined in the Major Hazards Report)
- The IVB is to provide independent assurance of Well Design and Well Control Measures
- The IVB is to undertake further verification on the Material Changes and to communicate the outcomes of this verification to the CA (if required)
- WSE required:
  - For Production Installations -> In place prior to operations
  - For **Non** Production Installations -> In place prior to the installation operates in EU waters
- **REQUIREMENTS FOR THE IVB:**

✓INDEPENDENCE

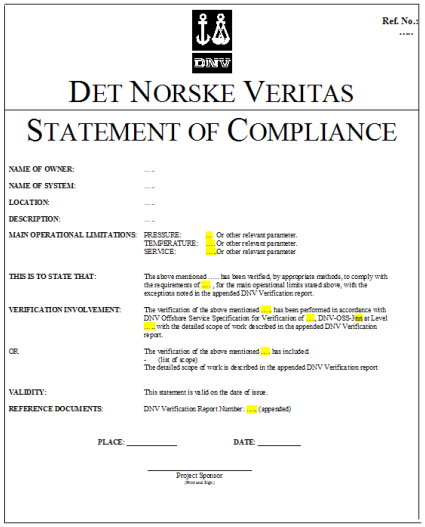
- His function does not require him to consider any aspect of a SCE and ECE or specified plant in which he was previously involved prior the verification activity or where his objectivity might be compromised;
- He is sufficiently independent of a management system which has, or has had, any responsibility for any aspect of a component in the scheme of independent verification or well examination so as to ensure he will be objective in carrying out his functions within the scheme.
- **Basically ICP must be sufficiently impartial and objective in their judgement so that safety is not compromised**

✓COMPETENCE

- Technical Competence – Suitable Qualifications, Adequate numbers, Sufficient Experience
- Suitable allocation of tasks by the IVB to staff qualified for those tasks

Definitions

- What do you understand by verification?
  - An **examination** to confirm that an activity, a product or a service is in accordance with **specified requirements**
- What do you understand by certification?
  - Confirmation through the provision of objective evidence that specified requirements have been fulfilled. Scope is defined by DNV GL or an Authority
- What is the main difference between verification and certification?
  - **The scope of work** for verification is ultimately decided by the customer, while the scope of work for certification is ultimately decided by DNV GL (or the national authorities when we issue certificates on their behalf).
  - After a Certification is completed a **Certificate** can be issued (specific forms). Delivery after verification will be a report or a Statement of Compliance, not a Certificate
  - Certification work is always done by an independent third party



Ref. No.:
.....

DET NORSKE VERITAS

STATEMENT OF COMPLIANCE

NAME OF OWNER: .....
NAME OF SYSTEM: .....
LOCATION: .....
DESCRIPTION: .....
MAIN OPERATIONAL LIMITATIONS: PRESSURE: ... Or other relevant parameter.
TEMPERATURE: ... Or other relevant parameter.
SERVICE: ... Or other relevant parameter

THIS IS TO STATE THAT: The above mentioned ..... has been verified, by appropriate methods, to comply with the requirements of ..., for the main operational limits stated above, with the exceptions noted in the appended DNV Verification report.

VERIFICATION INVOLVEMENT: The verification of the above mentioned ... has been performed in accordance with DNV Offshore Service Specification for Verification of ..., DNV-OSS-... at Level ... with the detailed scope of work described in the appended DNV Verification report.

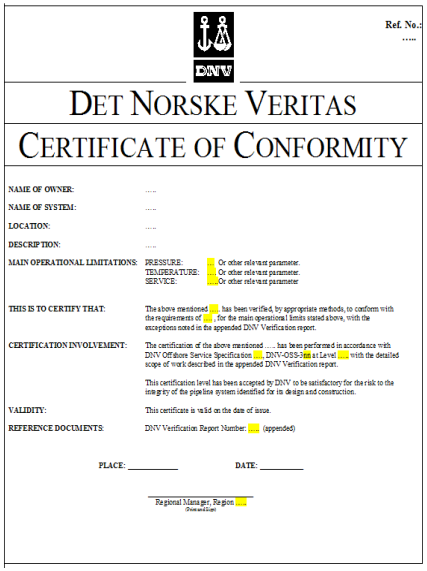
OR: The verification of the above mentioned ... has included:
- ... (list of scope)
The detailed scope of work is described in the appended DNV Verification report

VALIDITY: This statement is valid on the date of issue.

REFERENCE DOCUMENTS: DNV Verification Report Number: ... (appended)

PLACE: _____ DATE: _____

Project Sponsor
(Name and Sign)



Ref. No.:
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DET NORSKE VERITAS

CERTIFICATE OF CONFORMITY

NAME OF OWNER: .....
NAME OF SYSTEM: .....
LOCATION: .....
DESCRIPTION: .....
MAIN OPERATIONAL LIMITATIONS: PRESSURE: ... Or other relevant parameter.
TEMPERATURE: ... Or other relevant parameter.
SERVICE: ... Or other relevant parameter

THIS IS TO CERTIFY THAT: The above mentioned ... has been verified, by appropriate methods, to conform with the requirements of ..., for the main operational limits stated above, with the exceptions noted in the appended DNV Verification report.

CERTIFICATION INVOLVEMENT: The certification of the above mentioned ... has been performed in accordance with DNV Offshore Service Specification ..., DNV-OSS-... at Level ... with the detailed scope of work described in the appended DNV Verification report.

This certification level has been accepted by DNV to be satisfactory for the risk to the integrity of the pipeline system identified for its design and construction.

VALIDITY: This certificate is valid on the date of issue.

REFERENCE DOCUMENTS: DNV Verification Report Number: ... (appended)

PLACE: _____ DATE: _____

Regional Manager, Region ...
(Name and Sign)

What can you verify? - Three Examples …

Blue Stream

- Fully certified by DNV
- Certification plan used for communication and approval from authorities
- Involvement in design, fabrication and installation
- Water depth of 2150 m, large geohazards, very tight schedule

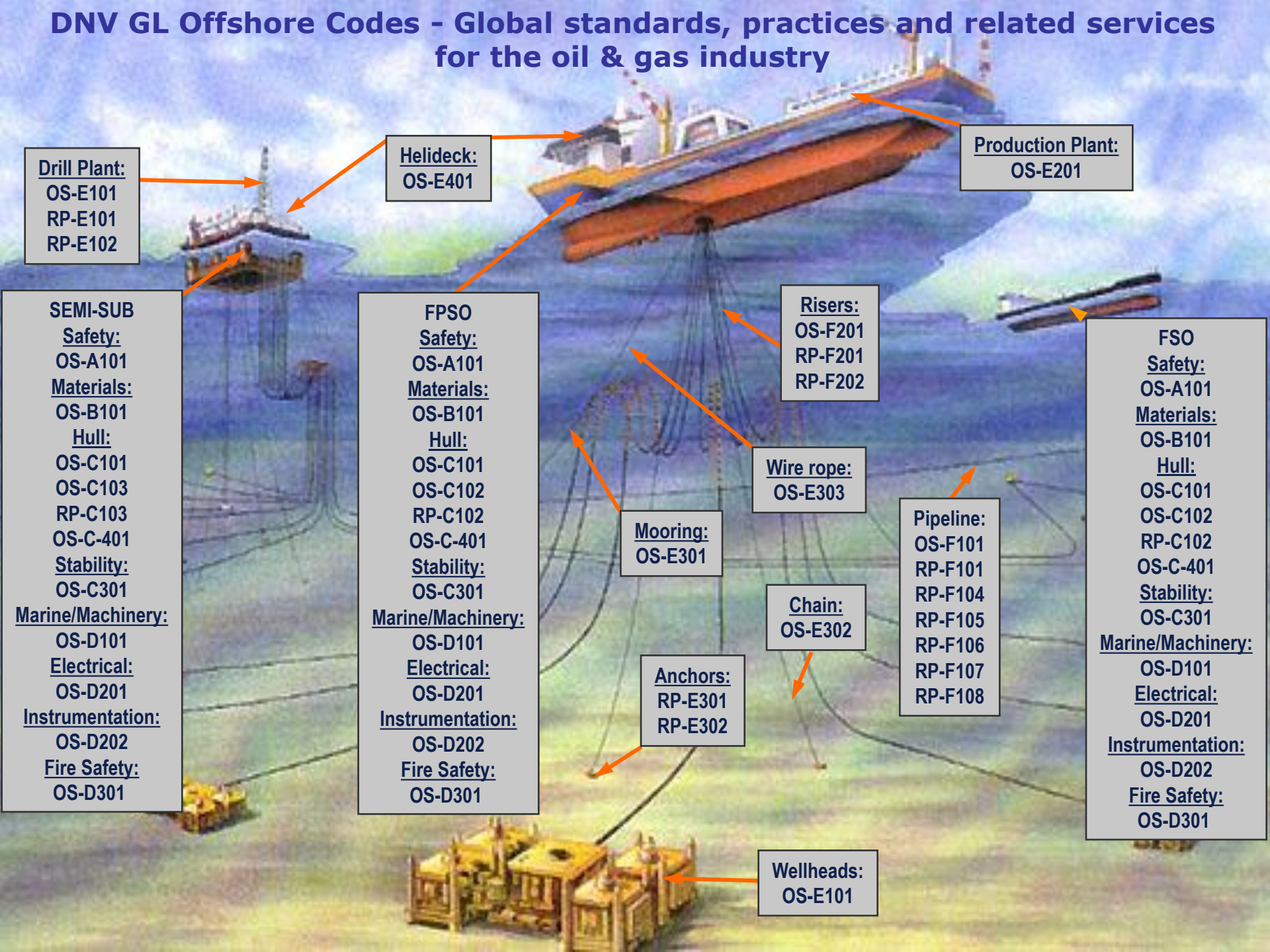
Kristin Platform

- Design Verification and construction follow up
- Integrated scope
- Marine operations verification
- Harsh environment, High pressures (900 bar) and high temperature

Maureen Alpha

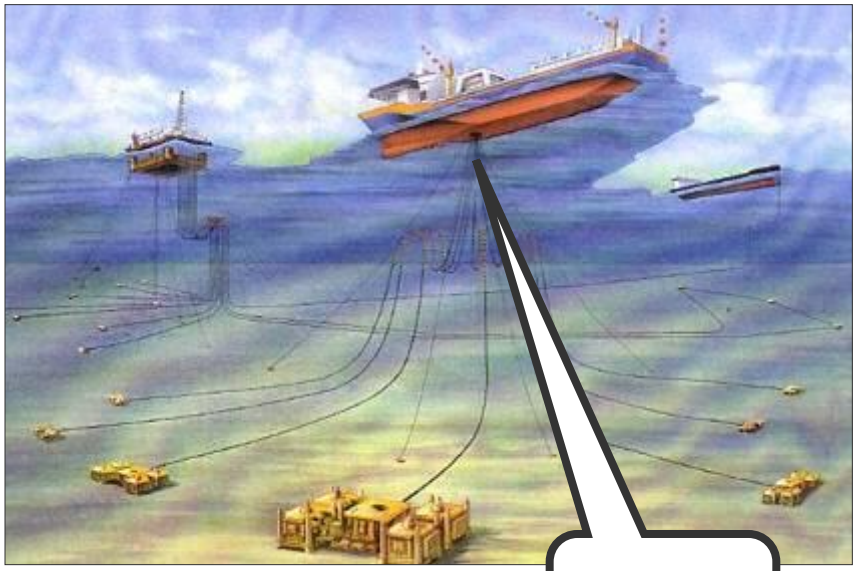
- Removal & Decommissioning verification
- Field refloat and tow to shore
- Inshore dismantling
- Onshore/at shore dismantling

DNV GL Offshore Codes - Global standards, practices and related services for the oil & gas industry



The definition of risk and risk levels

What are the critical elements of the object that needs to be verified?



Risk = Probability x Consequence of failure

Risk Levels of Verification

Level	Risk Characteristics	Verification Involvement
LOW	▪ Risks to the asset are lower than average, low consequences of failure. ▪ Proven designs, located in congenial conditions, manufacturing and installation by experienced contractors.	▪ Review of general principles during design and construction phases. ▪ Review of principal documents. ▪Site attendance only during system testing.
MEDIUM	▪ Asset in a moderate or well controlled environment. ▪ Plans with a moderate degree of novelty. ▪ Medium consequences of failure.	▪ Review of general principles during design and construction. ▪ Detailed review of selected principal documents. ▪ Full time attendance during qualification.
HIGH	▪ Innovative designs and plants with high degree of novelty or large leaps in technology. ▪ Extreme environmental conditions. ▪ Contractors with limited experience. ▪ Very high consequences of failure.	▪ Review of general principles during design and construction. ▪ Detailed review of most documents with independent analyses. ▪ Full time attendance at site for most activities.

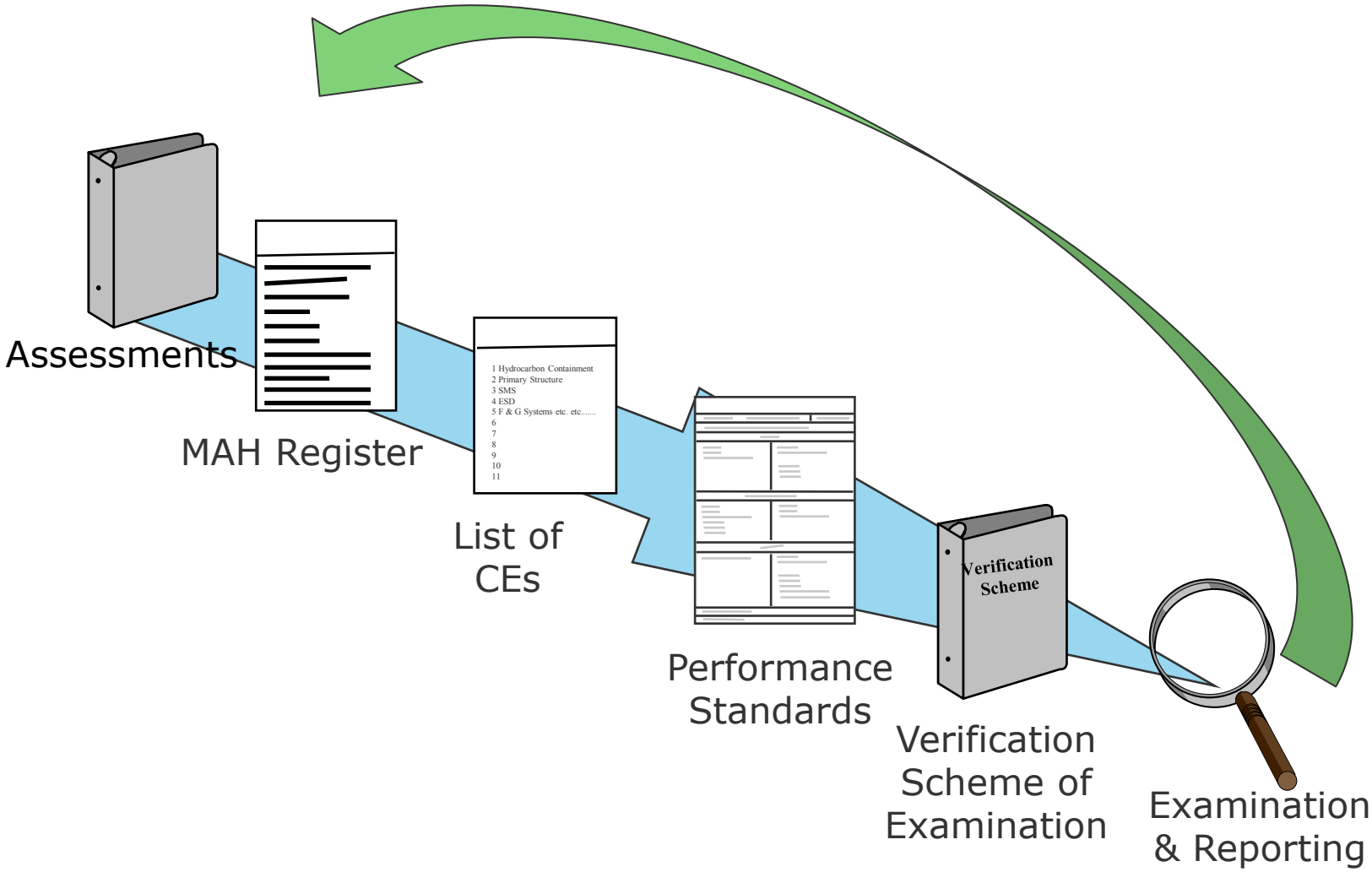
Example – Fabrication of Subsea umbilicals

Table E-1.5 Subsea control umbilicals manufacturing, sub-unit / unit and integration testing

	Description	Level		
		Low	Med	High
Initial activities				
1	Review quality management system	R2	R2	R2
2	Quality system audit at relevant manufacturers and sub-suppliers		x	x
3	Review of specifications and procedures			x
4	Technical / kick-off meeting and review of manufacturers documents	x	x	x
5	Verify the performance and testing during the procedure and personnel q		x	x
Surveillance and review activities				
6	Confirm items manufactured according to specificat - review manufacturing records are in ac specifications/procedures - review non-conformance logs	R1	R2	R2
12	Confirm correct system function articular attention to: - hydraulic fitness	S1	S3	S3
Final activities				
13	Confirm manifold/template functions by review of: - FAT records	I	R1	R2
14	Issue DNV visit / close-out report	H	H	H

Project Specific Verification Plan

Closed Loop Verification Process



Verification (UK safety case regulation)

Requirements:

- A Record of the Safety-Critical Elements (SCE) for an installation is made
- An Independent Competent Person (ICP) is invited to comment on the record of SCEs
- A Verification Scheme is made
- The Verification Scheme is implemented

Basically, the purpose of the Verification Scheme is to independently confirm the suitability of the Safety Critical Elements

UK approach: Verification Schemes

What is a Verification Scheme of Examination?

- Verification represents the activities, in addition to Assurance, which are performed by an ICP to confirm whether the SCEs will be, are, and remain suitable, or adequately specified and constructed, and are being maintained in adequate condition to meet the requirements of the Performance Standards
- An instruction to the ICP of "How" the ICP will confirm that SCEs are suitable – design review, audit, inspection etc..
- Set frequencies of examination (for *continued suitability*)
- Put procedures in place for managing Verification Scheme

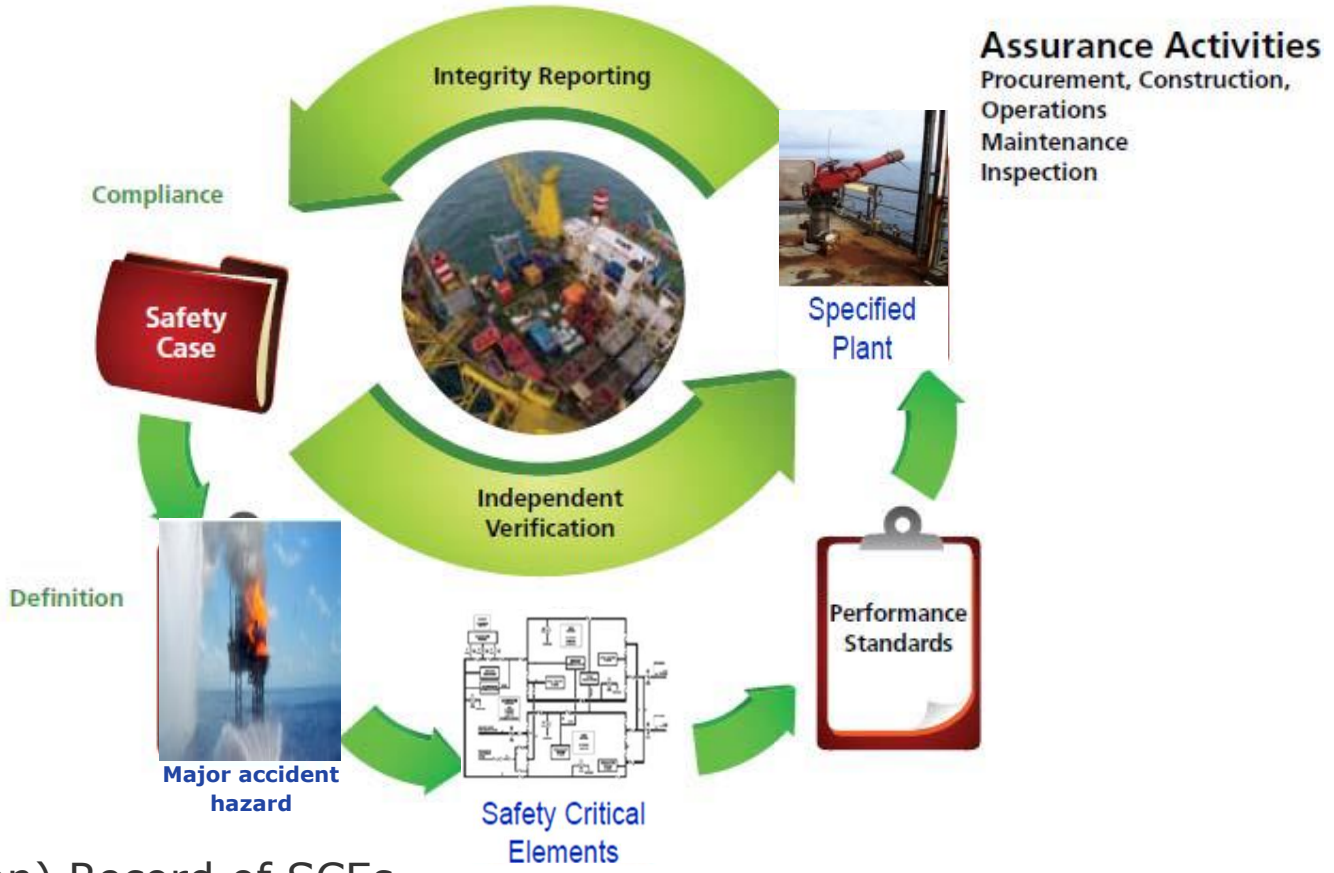
When is a Verification Scheme of Examination required?

- At the start of a project (new-build – initial suitability), or at the start of operations (continuing suitability)

A typical Operational Verification Scheme will specify the following types of activities:

Type	Verification Activities (Nature)
OFFSHORE	• Witness SCE Assurance activities, e.g. tests, inspections, musters etc. • Visually examine condition of SCEs, e.g. piping, vessels, hazardous area equipment etc. • Audit compliance with SCE Assurance Processes, e.g. Control of Temporary Equipment, Management of Inhibits, Control of Valves, Management of Defined Life Repairs etc., through inspection and testing, and the review of any offshore records

UK approach: VERIFICATION SCHEME



ICP Deliverables:

- Review of (Comment on) Record of SCEs
- Review of (Comment on) Verification Scheme
- Statement of Suitability of SCEs

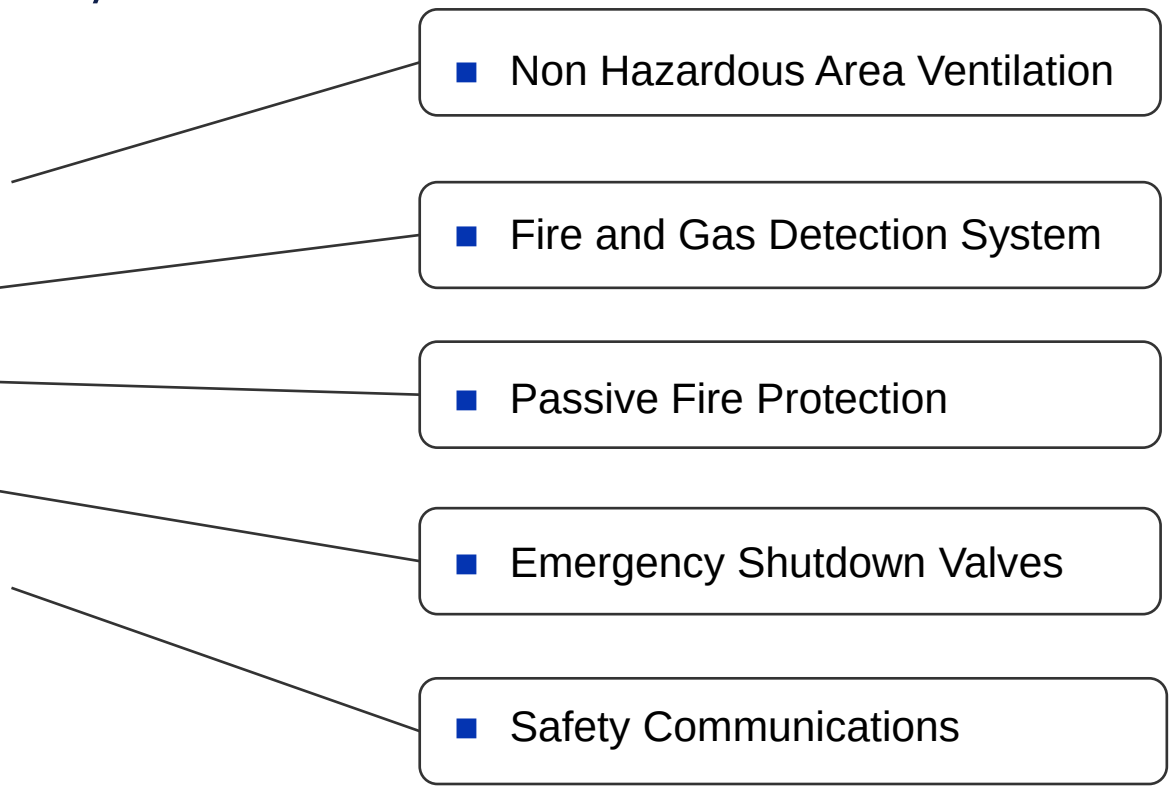
Safety Critical Elements

- Plant and equipment that are vital to prevent – detect – control – mitigate – respond to a major accident are known as 'safety critical elements' or SCE (e.g. emergency shutdown valve, fire water deluge system, gas detectors, temporary refuge, lifeboats etc.).
- Such equipment must reliably meet a minimum Performance Standard and be capable of performing as intended, when required
- SCEs must be designed, constructed, installed, inspected, tested and maintained in adequate condition so that they can perform their intended safety function
- If your SCEs meet their performance standard at all times then the likelihood of a major accident is low. If they do not, the risk is increased.

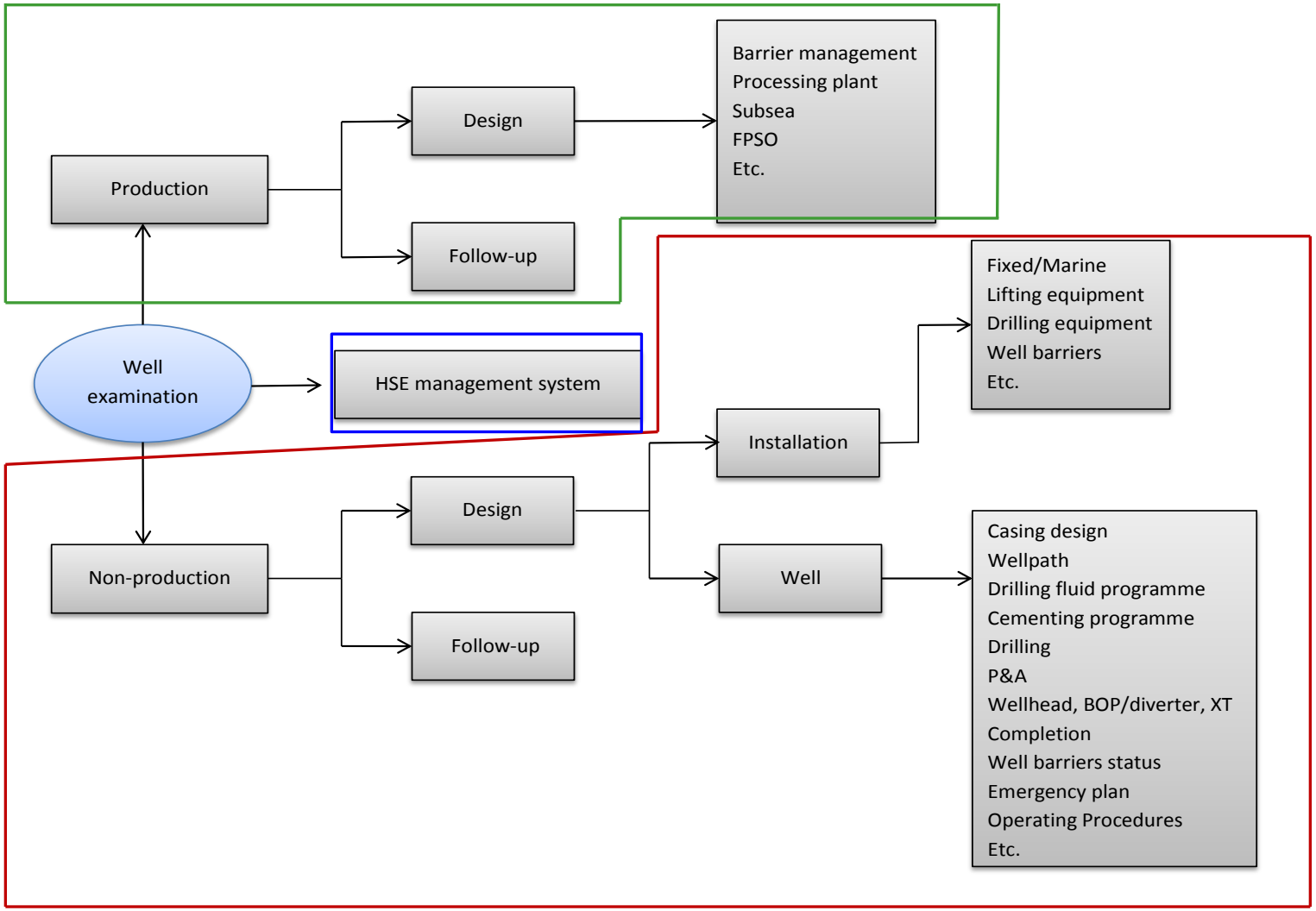
MAHs & SCEs

The Safety Critical Elements (SCE) can be grouped under the primary safety functions/barriers of:

- Structural Integrity
- Process Containment
- Ignition Control
- Detection
- Protection
- Shutdown
- Emergency Response
- Life Saving



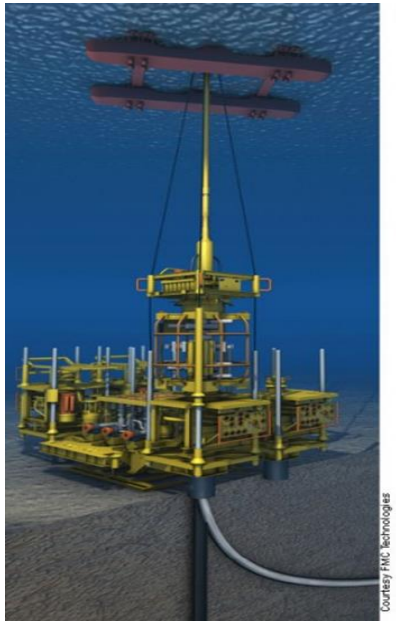
EU Directive – Well Examination: What need to be a part of the verification scheme?



Well and emergency response activities required by the EU Directive

- Well examination & verification for all the well phases:

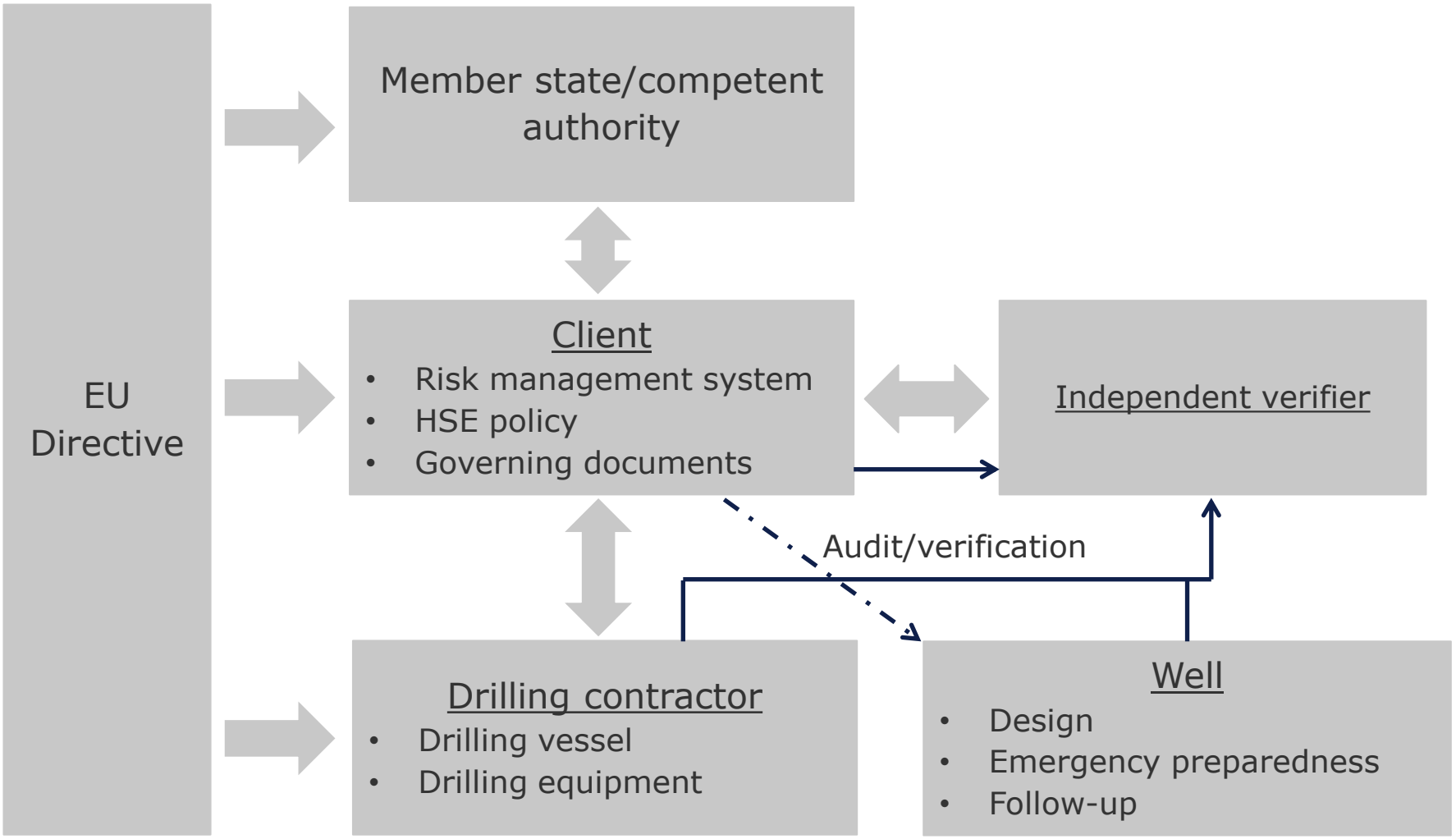
design	planning	construction
workover/intervention	abandonment, suspension	design changes



- Independent design review of:

Drilling program,	casing/tubing,	completion,	well test,	workover and/or well intervention,
suspension/ abandonment,	compliance with local/national regulations	and operator's internal policies	well operations program	Well fluids and cementing operations
Well trajectory (well location, anti-collision)	Handling of hazardous substances (H2S, CO2	Emergency response plan (including relief well planning)		Well control equipment & barrier management

The independent verifier



Criticalities on well examination…

- Several companies can deliver today Well examination services on well designs, perform risk assessment etc. BUT….
  - Very few are able to deliver expertise in all areas within Oil and Gas
  - One is DNV GL

- Other
  - ISO 17969 (under development) deals with Competency Management System (CMS) for well personnel
  - Annex D in ISO 17969 states the Competence profile for Well Examiner

Performance Standards

All SCEs are subject to independent verification against detailed Performance Standards.

- A *Performance Standard* is a statement which can be expressed in qualitative or quantitative terms of the performance required of a critical system, item or procedure
- They are used as the basis for managing the *major accident hazards*
- Define the SCE Goal – Boundary – Functionality – Availability/Reliability – Survivability – Dependencies/Interactions
- State clearly defined criteria against a functional goal
- Are used as the basis for managing the *major accident hazards*
- Apply throughout the *lifecycle* of the installation in order to ensure safety, functionality, availability/reliability and survivability of an entire facility, or selected elements
- Incorporate Codes & Standards
- Are subject to independent verification as defined in the Written Scheme of Verification

Performance Standards

- Function
  - The functional criteria will include appropriate definition of requirements to the relevant functional parameters of the particular barrier;
  - i.e the essential duties that the system/function is expected to perform (ref. ISO 13702).
- Integrity
  - The integrity criteria will include appropriate definition of and requirements to the relevant reliability and availability parameters of the particular barrier;
  - i.e probability of failure on demand, failure rates, demand rates, test frequencies, deterioration of system components, environmental impairment etc. (ref. ISO 13702).
- Survivability
  - Criteria determining how a barrier will remain functional after a major incident,
  - i.e under the emergency conditions that may be present when it is required to operate (ref. ISO 13702)
- Management
  - Criteria for checking if the systems are adequately maintained operated and managed.
  - i.e verifying that competence and training are adequate and that the procedures are relevant and cover the necessary subjects.

Performance can include capacity, reliability, accessibility, efficiency, ability to withstand loads, integrity and robustness.

Performance Standards

Performance Standards must meet all of the following criteria:

- **S**pecific **That it is clear as to exactly which part(s) of the SCE the performance standard applies to.**
- **M**easurable **That the SCE (or part of an SCE) can be easily assessed for achievement of its performance target (goal, or PS), in a consistent and predictable way.**
- **A**chievable **That it can be reasonably expected that the SCE (or part of an SCE) will be demonstrated to meet the specified criteria, given industry practice**
- **R**elevant **That the performance standard is directly linked to one or more Major Accident Hazards for that SCE, i.e. achievement of the performance standard directly contributes to preventing, detecting, controlling, mitigating or responding to a Major Accident Hazard.**
- **T**imebound **That it is clear as to exactly when the SCE (or part of) is required to achieve the performance requirement, and for how long.**

*Experience has proven too many performance standards to be **un**verifiable because one or more of the above are not met*

Summary – What's Changing

- The creation of an independent offshore competent authority
- Integrating the management of safety and environmental risks, which impacts on the safety case, well notification, independent verification scheme and well examination requirements
- Introduction of independent verification for environmental critical elements
- Requirements for the production of a corporate major accident policy
- New requirements on liability for environmental damage
- Duties on operators to report a range of new incidents and dangerous occurrences to the competent authority
- Duties on operators registered in the Member States to report major accidents that occur outside of Europe
- There are also transitional arrangements covering existing installations and wells

Blackbeard?

- An interesting contrast, draw your own conclusions
- September 2006 Exxon was drilling a well called Blackbeard in the Gulf of Mexico
- After 500 days of drilling and many problems, the well reached 30,067 feet, a record at that time, and very close to its target depth of 32,000 feet
- The well experienced a kick, and attempts to control the well with mud were unsuccessful, pressures in the well were unstable
- The geoscientists wanted to keep going, the drillers did not
- The debate arrived at the desk of the CEO Rex Tillerson within hours, and Tillerson decided to abandon the well, writing off $187 million in the process
- Exxon were widely criticised at the time for “lacking guts”
- The reality is the Exxon learned many key lessons related to risk management from the Exxon Valdez accident in 1989, and applied them rigorously

Fabio Lo Brutto, Fabio.Maria.Lobrutto@dnvgl.com

For information please contact:
Fabio.Maria.Lobrutto@dnvgl.com
+39 348 7719901

www.dnvgl.com

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