

**KP4**

**AGEING & LIFE EXTENSION  
INSPECTION PROGRAMME**

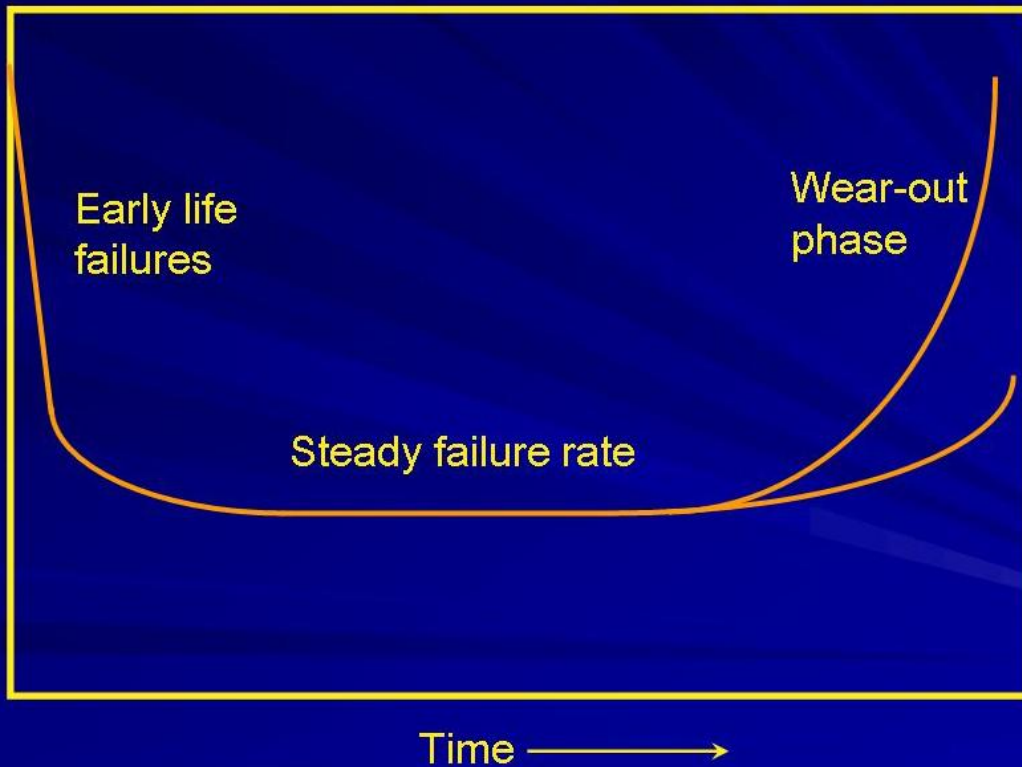
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# PRESENTATION OUTLINE

- Regulatory & management aspects
- Details of KP4: Ageing & Life Extension Inspection Programme
  - Aim / objectives
  - Activities
  - Technical scope
  - Outputs

# AGEING OVERVIEW



Evidence of degradation and damage

**OR**

*Insufficient knowledge / information to know the extent of possible deterioration*

Need to consider effects of:

- accumulating or accelerating damage
- modifications
- obsolescence
- changes of process & / or well conditions
- advances in knowledge and technology
- organisational issues / loss of corporate knowledge

# OSD STRATEGY

<http://www.hse.gov.uk/offshore/priorities.htm>

## OSD Mission Statement

*'Our mission is to assure safe management and control of major accident hazard risks and prevent catastrophic incidents in the offshore oil and gas industry'*

## Priorities

- Leadership
- Safety Culture / Workforce Involvement
- Asset integrity (Ageing installations)



# UK REGULATORY PROVISIONS FOR AGEING

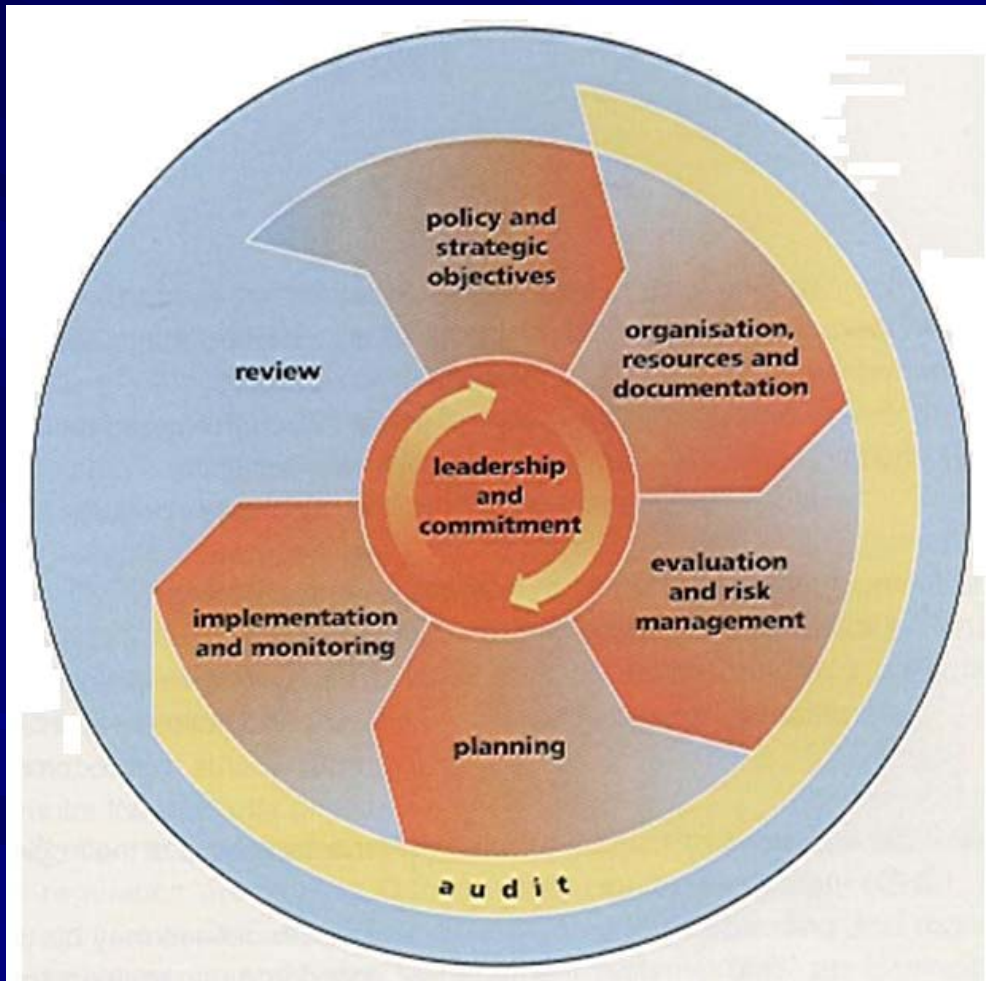
- HSWA (1974) / MHSWA (2003)
- DCR (1996): 'Foreseeable damage'
  - Periodic maintenance / remedial work
  - Performance standards
  - Independent verification by ICP
- PFEER (1995):
  - Inherent safety by design, preventive, detection, control and mitigation measures
- PSR (1996): life cycle requirements
  - to maintain pipeline '*in an efficient state, in efficient working order and in good repair*';
  - to identify hazards, evaluation of risks (including susceptibility to damage)
- PUWER (1998):
  - Control of hazards due to equipment failure; requirement for appropriate inspection and maintenance procedures to be in place
- SCR (2005): 5-yearly safety case 'thorough review' and revision:
  - Safety case revision if proposed to extend use beyond design life
  - Explicit reference to 'life extension' clarifies the need for specific consideration
  - 'HSE may direct that a revision is made under Regulation 15' if the safety case is no longer satisfactory
- Use of good practice (e.g. HSG65), modern codes & standards (e.g. ISO)



# THOROUGH REVIEWS

- SCR 05 requires the DH to perform a 5-yearly Thorough Review of the safety case
- Specific consideration of life extension beyond the design life is a requirement
- Thorough Review needs to address ageing issues to ensure demonstration in the SC that the installation can continue to be operated safely
- HSE Guidance on Ageing / LE:
  - OIS 4/2009
  - OIS 5/2007
- Need to inspect Thorough Reviews to confirm that:
  - Ageing issues have been identified
  - Ageing issues are being adequately managed
  - Reasonably practicable improvements are identified and implemented

# APPLICATION OF HSG65 / OGP MODEL TO AGEING MANAGEMENT



- Management of Ageing & Life Extension integral part of AIM system
- Corporate culture: leadership, sharing etc.
- Policy
- Organising
- Planning & Implementation
- Measuring performance
- Audit
- Review

# ORGANISATIONAL REQUIREMENTS

- Demonstration that the organisation is aware of ageing challenges at all levels, incl. senior management
- Demonstration that workforce has adequate experience, competence and training to manage ageing issues
- Definition of key responsibilities, management structure, communications and resources
- Highlight of management measures that differentiate life extension from day-to-day problem shooting

# KEY PERFORMANCE INDICATORS

Measurable KPIs are required to ensure that ageing of the offshore installation is being adequately managed:

<b>High Level</b>	<ul style="list-style-type: none"><li>• Senior management commitment</li><li>• Investment and long-term planning: a commitment to proactive investment</li><li>• Planning for success: providing competent staff and sufficient resource</li><li>• A role for technical engineering</li></ul>
<b>Mid Level</b>	<ul style="list-style-type: none"><li>• Trend analysis of safety critical elements</li><li>• Reviews of maintenance strategy</li><li>• Root cause analysis of ongoing maintenance problems</li></ul>
<b>Low level</b>	<ul style="list-style-type: none"><li>• Number of temporary repairs in place</li></ul>

# KP4 AIM & OBJECTIVES

## AIM

To ensure that the risks to asset integrity associated with ageing and life extension are controlled effectively

## OBJECTIVES

- To raise **awareness** of the need for specific consideration of ageing issues
- To **inspect** individual duty holder approaches to the management of ageing and life extension
- To identify **shortcomings** and **enforce** an appropriate programme of remedial action (e.g. **revision of the safety case**);
- To develop a **common industry approach** to the management of ageing installations to ensure the safe operation of all offshore installations on the UKCS



# PILOT STUDY (2009)

- 3 duty holders
  - Generic management, Structural integrity, Fire & explosion, Corrosion, Mechanical systems integrity
  - Set of standard questions for each topic area – ‘templates’
- 
- **Key findings:**
    - Lack of full recognition of significance of ageing processes in connection with life extension
    - Ageing not considered explicitly
    - Varied approach between DHs and topics – asset maintenance not always a high priority
  - **Related issues:**
    - Influence of commercial pressures on AIM
    - Reliance on contractors and ICP
  - **DH engagement:**
    - Awareness of OIS 4/2009 - Importance of HSE website
    - Support for an industry forum on ageing issues
  - **Conclusion: Need for full programme**

# AGEING & LE INSPECTION PROGRAMME 2010 - 2013

- Full programme: 2010 – 2013
- Supported by HSE (OSD) policy and strategy documents
- Inspection of **DH Asset Integrity Management Systems**
- Ageing fixed and mobile installations
- Onshore and offshore inspections
- To inspect **Thorough Reviews**
  - have A&LE been addressed?
  - how?



# KP4 – SUPPORTING ACTIVITIES

- Development of best practice on Ageing & Life Extension
- Stakeholder engagement
  - Incl. Network on Ageing & Life Extension
- Review & updating / development of standards and guidance (incl. [OIS 4/2009](#) on Thorough Review Guidance)
- R&D on A&LE aspects of AIM

# TECHNICAL SCOPE

- Topics:
  - Organisational factors
  - Structural integrity
  - Materials
  - Maritime integrity
  - Process plant integrity
  - Fire & blast
  - Mechanical integrity
  - Electrical & control systems integrity
  - Wells
  - Pipelines
- Standardised approach: Use of templates (KP3, Pilot Study)

# HSE POLICY & STRATEGY DOCUMENTS

- **Policy:**
  - Regulatory context
  - Ageing & LE in the AIM system
  - Key issues
  - Performance indicators (examples)
- **Strategy:**
  - Aims & objectives
  - Methodology
  - Priority topic areas
  - Stakeholder engagement
  - Guidance / R&D
- **Summary Guidance**
  - Key ageing issues



# TOPIC ISSUES - 1

TOPIC	AGEING ISSUES - EXAMPLES
Organisation	<ul style="list-style-type: none"><li>• Explicit senior management commitment</li><li>• Formal policy – recognition, safety management culture</li><li>• Resourcing; Competence</li></ul>
Structural integrity	<ul style="list-style-type: none"><li>• Understanding of structural condition – insp. techniques / frequency</li><li>• Understanding of structural performance - (advanced) technology</li><li>• Interaction / Cumulative effects</li><li>• Assessment of safety margins</li></ul>
Maritime integrity	<ul style="list-style-type: none"><li>• Loss of stability &amp; position (mooring, DP systems) [OIS 5/2007]</li><li>• Reassessment of integrity (e.g. redundancy) due to modifications, environmental criteria, corrosion, wear</li><li>• Review of original design basis; changes in standards</li><li>• Obsolescence (e.g. marine systems – ballast valves, actuators)</li></ul>

# TOPIC ISSUES - 2

TOPIC	AGEING ISSUES - EXAMPLES
Materials	<p>Detailed knowledge / understanding of degradation mechanisms:</p> <ul style="list-style-type: none"><li>• Corrosion-related degradation – internal and external</li><li>• Environmental cracking, e.g. chloride stress corrosion cracking</li><li>• Microstructural changes leading to embrittlement</li></ul>
Mechanical integrity	<ul style="list-style-type: none"><li>• Corrosion / erosion / fatigue / obsolescence of static equipment, machines &amp; rotating equipment, cranes, non-metallic piping / vessels, seals</li></ul>
Process integrity	<ul style="list-style-type: none"><li>• Loss of containment incident rate</li><li>• Operational risk assessment (ORA) to identify deviations from design</li><li>• Process modifications / additions – revalidation of design spec.</li></ul>
Fire & Explosion Integrity	<ul style="list-style-type: none"><li>• Evaluation of change of risk due to modifications, deterioration &amp; reservoir / process evolution</li><li>• Adequacy of leak &amp; fire detection systems (substantial technology advances made)</li><li>• Blockage of HVAC due to additional plant – increased overpressures</li><li>• Effectiveness of fire protection in the light of new knowledge</li></ul>

# TOPIC ISSUES - 3

TOPIC	AGEING ISSUES - EXAMPLES
Electrical & Control Systems Integrity	<ul style="list-style-type: none"><li>• Degradation</li><li>• Challenge to design capability from environmental changes</li><li>• Obsolescence</li></ul>
Wells	<ul style="list-style-type: none"><li>• Mechanical wear, corrosion, fatigue, erosion, hydrogen cracking, environmental (pressure, temperature) variations</li><li>• Insufficient knowledge of material degradation, fatigue of subsea wellheads &amp; X-mas trees, leakage frequencies, loads (drilling, production, workover), condition of uninspectable areas (e.g. subsea wellheads)</li></ul>
Pipelines	<ul style="list-style-type: none"><li>• Time-dependent processes (mechanical defects / damage, corrosion, fatigue) – accumulation</li><li>• Life extension - Potential exceedance of original design limits (new standards, reduced performance)</li></ul>

# DH INSPECTION PROGRAMME – Outline Plan

	Fixed platforms		Semi-submersibles & FPSOs		Jack-ups	
	Onshore	Offshore	Onshore	Offshore	Onshore	Offshore
Year 1	8	4	-	-	-	-
Year 2	8	4	4	2	4	2
Year 3	8	4	4	2	4	2

Duty holder prioritisation:

- asset condition / platform age
- manning
- known issues (PAITs / TRs)

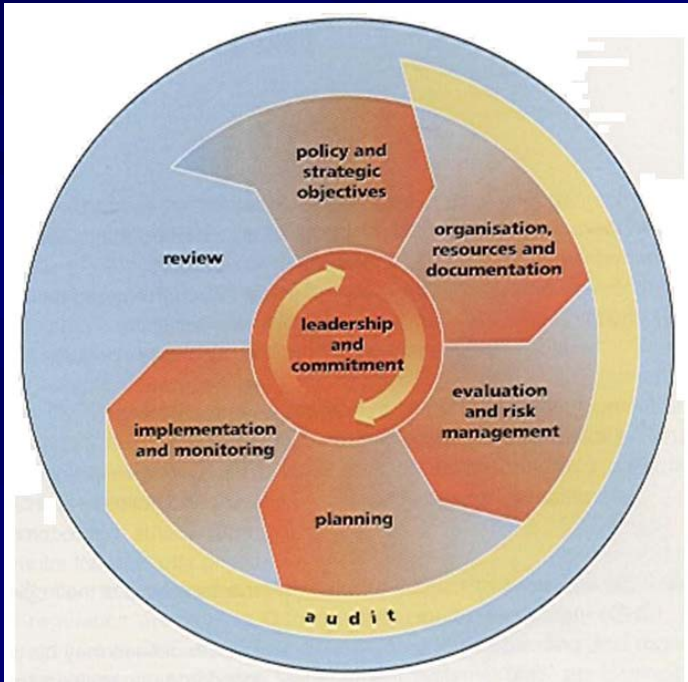


# APPROACH TO DH INSPECTION

- **General**
  - Emphasis on partnership with industry, influence, collaboration, underpinned by offshore regulations
- **Onshore**
  - Topic teams (Manageable groups; Alignment with existing inspection plan)
  - Templates
  - Link to Thorough Reviews
- **Offshore:**
  - Verification of onshore findings
  - Workforce involvement & awareness of importance of management of ageing SCEs
  - To provide visibility of KP4 to offshore workforce



# DH INSPECTION



- Demonstration that Ageing / LE have been considered explicitly
- Clarification of considerations and activities beyond routine AIM
  - Leadership / Commitment
  - Policy / strategy
  - Organising
  - Planning & Implementation
  - Measuring performance
  - Review
  - Audit / Verification

# STAKEHOLDER ENGAGEMENT

- Engagement with DH senior management
- Liaison with key industry bodies
  - OIAC, Step Change In Safety, Oil & Gas UK, IADC, BROA
- Liaison with other regulators (e.g. PSA, ICRARD)
- HSE-led industry briefings
- HSE / Offshore industry network on Ageing & Life Extension
- Dissemination:
  - workshops, seminars, conferences, journals, etc.
- HSE Ageing webpage
- Press releases



# NETWORK ON AGEING & LIFE EXTENSION

- Forum for discussion and exchange of information and experience
  - to facilitate development of best practice in the North Sea
- Involvement of all UK stakeholders, including trade associations (e.g. O&GUK) and other regulators
- To be run by third party (e.g. Energy Institute?)
- Cross-industry committee
- Periodic meetings / seminars
- Dissemination / Publicity – website

# OSD AGEING WEBPAGE

<http://www.hse.gov.uk/offshore/ageing.htm>

21/06/2010 HSE Offshore: Ageing & life extension o...

**Health and Safety Executive**  
HSE

## Ageing & life extension of offshore installations

Asset integrity is of major concern to HSE and Ageing processes present a significant risk to the integrity of offshore installations. This page has been introduced to provide information on Ageing and Life Extension issues relevant to offshore installations.

This webpage will be updated regularly to include information and links to sources of information on, for example,

- the Ageing and Life Extension Inspection Programme (2010 - 2013);
- standards, guidance, good practice;
- science and technology findings; and
- operational issues.


Current guidance includes:

1. [Offshore Information Sheet 5/2007, 'Ageing Semi-submersible Installations'](#)
2. [Offshore Information Sheet 4/2009, 'Guidance on Management of Ageing and Thorough Reviews of Ageing Installations'](#)

To receive the latest of updates to this page, and other information information on offshore oil and gas, please subscribe to our [free offshore e-Bulletin](#).

### Link URLs in this page

1. Offshore installations on the UKCS by age  
<http://www.hse.gov.uk/offshore/images/ageing.jpg>
2. Offshore Information Sheet 5/2007, 'Ageing Semi-submersible Installations'  
<http://www.hse.gov.uk/offshore/infosheets/is5-2007.pdf>
3. Offshore Information Sheet 4/2009, 'Guidance on Management of Ageing and Thorough Reviews of Ageing Installations'  
<http://www.hse.gov.uk/offshore/infosheets/is4-2009.pdf>
4. free offshore e-Bulletin  
<http://www.hse.gov.uk/offshore/ebulletin/index.htm>



[1] Offshore installations on the UKCS by age

[www.hse.gov.uk/offshore/ageing.htm](http://www.hse.gov.uk/offshore/ageing.htm)

1/1

- Primary source of information on ageing offshore installations
- To provide information on:
  - Press releases
  - Inspection findings
  - Operational issues
  - Standards, technical / guidance documents
  - R&D
  - Industry meetings
  - Relevant websites (e.g. PSA, EI)



# HSE GUIDANCE ON THOROUGH REVIEWS - OIS 4/2009

- Thorough review of the safety case
  - Thorough review summary
  - Asset life extension
- Management of ageing
  - Fire and explosion risk assessment
  - Structural integrity
  - Performance indicators
  - Organisational issues
- Issues with ageing

# GUIDANCE DEVELOPMENT

- Need to expand existing guidance to include all relevant major hazards and all aspects of thorough reviews
- Summary guidance document
- Detailed guidance document

# INSPECTION PROGRAMME

## – Key Targets

- Industry recognition of the importance of Ageing and LE
  - key element of the AIM system at all management levels
- Integration into corporate safety culture
  - explicit reference and justification in relevant documentation (e.g. corporate policy, safety cases, thorough reviews)
- **Improved integrity management / enhanced safety**

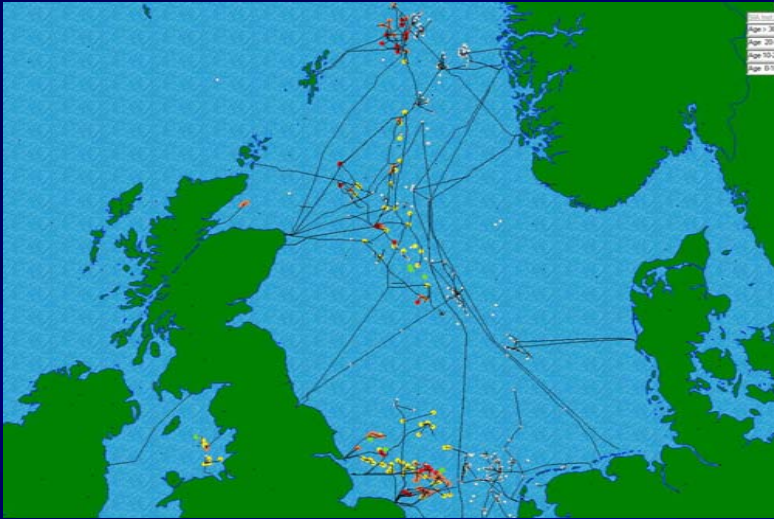
# INSPECTION PROGRAMME – Practical Outputs

- **Guidance** on Ageing, Life Extension & the Thorough Review process
  - **Industry network** for the exchange information and experience on ageing and life extension issues
- 
- **Seminars and workshops** to raise awareness of ageing issues
  - **Feedback** to industry
  - **Interim & final reports**
  - **Evidence** in future Safety Cases and Thorough Reviews that Ageing & Life Extension have been addressed

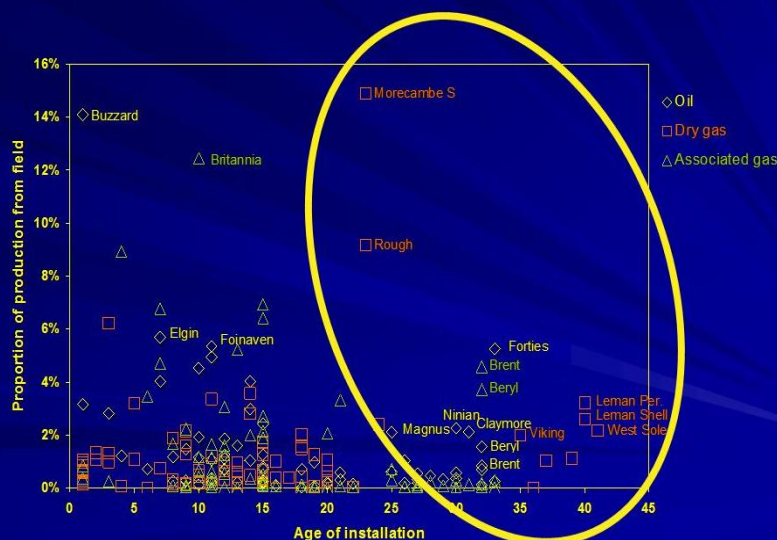
# SUMMARY



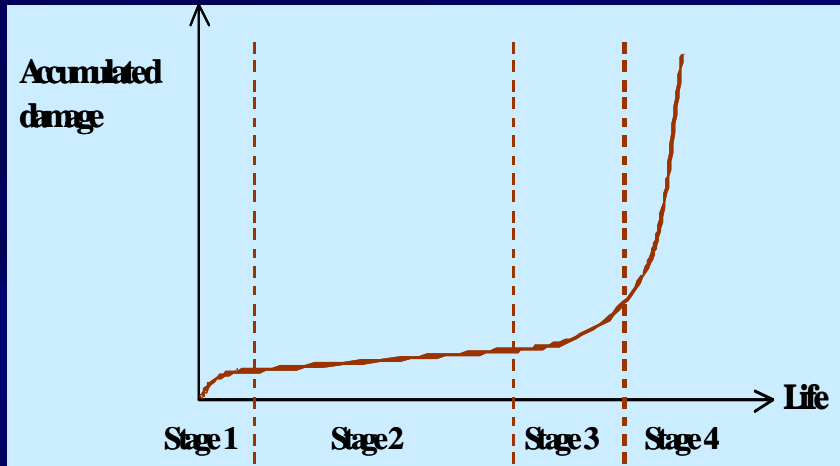
# SEMINAR CONTENT – HH (HSE)



- General context
- Background:
  - HSE priorities
  - UKCS
- Thorough Reviews (SCR 05):
  - Identification of ageing issues
  - Demonstration that ageing is managed properly
- OSD interventions (KP3 etc.)
- Need for KP4



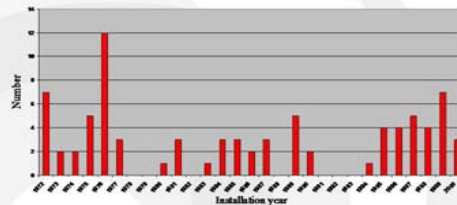
# SEMINAR CONTENT – JW (TWI)



- Concept of Ageing / LE, Definitions
- Ageing scenarios
- Significance of management of Ageing & Life Extension:
  - good data on current condition
  - understanding of degradation processes & response
  - use of best technology / latest assessment methods (e.g. system strength) to determine safety margins
- Regulations, standards, guidance, technology, industry fora
- Review of other industry sectors and application to offshore installations – recognition, leadership

# SEMINAR CONTENT – GE (PSA)

## Facilities on the Norwegian continental shelf

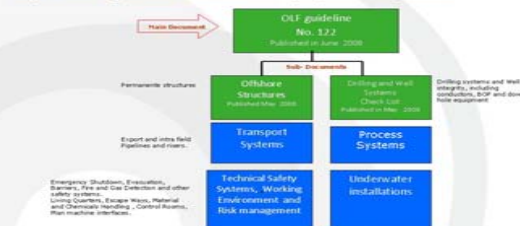


## Old and degraded / damaged



## Consent Applications for Lifetime Extension of Facilities

Scope of the OLF guideline for assessments and preparation of applications



- Importance of Ageing on the NCS – Regs (2002)
- PSA activities on Ageing and Life Extension
  - Life extension applications
  - Standards & guidance on management of ageing and life extension (with OLF)
  - R&D
  - Stakeholder engagement
  - PSA / HSE collaboration
- Norwegian petroleum industry initiative - OLF
- Findings from Norwegian Ageing programme



# PRESENTATION OUTLINE

- Regulatory & management aspects
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# CONCLUSIONS

- Consideration of ageing issues is a key element of the safety management of offshore assets
- Leadership
  - Need for senior management involvement
- **Way forward:** KP4 Ageing & LE Inspection Programme
  - KP4 to build on outcomes of KP3
  - All Duty Holders on UKCS
  - Inspection of Thorough Reviews
- HSE to collaborate with the UK industry towards a unified approach to the safety management of all ageing offshore infrastructure
  - Long-term planning
  - Implementation in Safety Cases & Thorough Reviews
- Ageing offshore installations are set to be a key HSE priority for the foreseeable future



<http://www.hse.gov.uk>

<http://www.hse.gov.uk/offshore/ageing.htm>

