
High level framework for
process safety management

HIGH LEVEL FRAMEWORK FOR PROCESS SAFETY MANAGEMENT

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CONTENTS

	Page
Foreword	v
Acknowledgements	vi
1 Introduction	1
1.1 Development approach	1
1.2 Scope and application	2
2 Outline of EI High level framework for process safety management	4
2.1 PSM focus areas	4
2.1.1 Process safety leadership	4
2.1.2 Risk identification and assessment	4
2.1.3 Risk management	5
2.1.4 Review and improvement	5
2.2 PSM elements	5
2.2.1 Process safety leadership	5
2.2.2 Risk identification and assessment	5
2.2.3 Risk management	5
2.2.4 Review and Improvement	6
2.3 PSM expectations	6
Annexes:	
Annex A Glossary	32
A.1 Introduction	32
A.2 Glossary of abbreviations	32
Annex B References	33

"Controlling risks within major hazard enterprises requires a robust process safety management system, driven forward by high standards of leadership and supported by effective feedback mechanisms to show the status of critical control measures. The value of this guidance produced by the Energy Institute is that it sets out a clear framework on which to develop and implement a process safety management system and from which effective 'on the ground' control measures can be derived and maintained. Lessons from recent major incidents both in the UK and internationally show in very stark terms the costs of getting process safety management wrong and I would encourage you to apply those lessons to your own organisation by the adoption and maintenance of a robust process safety management system."

Gordon Macdonald
Director - Hazardous Installations Directorate
Health and Safety Executive

FOREWORD

Process safety management (PSM) is a major issue for the energy industry, with many organisations looking to adopt a more holistic and systematic approach to assuring the integrity of their operations.

The Energy Institute (EI) Process Safety Committee (PSC) identified a benefit in promoting a common high-level framework for PSM across the energy industry sectors. EI *High level framework for process safety management* ('*PSM framework*') provides a simple and systematic approach suitable for organisations large and small across the energy industry sectors, defining the key things organisations need to get right in order to assure the integrity of their operations incorporating technical, maintenance, operational, and human and organisational factors.

EI *PSM framework* provides a consistent approach that should help organisations seeking efficient development and implementation approaches to achieve effective PSM. It is intended to be applicable to both large and small organisations in the worldwide energy industry sectors from upstream production through to power distribution, as well as kindred industries like chemicals; however the depth of application should vary in order to be applicable to the scope and complexity of their operations.

EI *PSM framework* is not intended to replace existing process safety or health, safety and environmental management systems (HS&EMSs). It sets out what should be covered by an existing management system (MS) and as such provides a benchmark for good practice. In cases where an organisation does not have a process safety management system (PSMS), EI *PSM framework* provides a design basis for its development. It is also intended to provide a common basis for benchmarking of PSMSs.

EI *PSM framework* consists of three levels:

Focus areas	These set out the key high level components of EI <i>PSM framework</i> .
Elements	Within each of the focus areas are a number of elements which set out the key aspects of the operation that organisations need to get right in order to assure their integrity.
Expectations	Within each of the elements the expectations define what organisations need to get right in order to meet the intent of each element.

Whilst there are other MSs that cover process safety, a key benefit of EI *PSM framework* is that it has been developed by the energy industry for use by energy industry sectors, capturing and incorporating learnings from people with practical experience of developing and implementing PSM as part of an integrated MS. It also benefited from extensive stakeholder input and consultation during its development.

For further information regarding the EI's PSM activities, see www.energyinst.org/psm-framework.

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Suggested revisions are invited and should be submitted through the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR, e: technical@energyinst.org

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1 INTRODUCTION

The Energy Institute (EI) Process Safety Committee (PSC) identified a benefit in promoting a common high-level framework for process safety management (PSM) across the energy industry sectors.

Process safety is a blend of engineering and management skills focused on preventing catastrophic accidents and near hits, particularly, structural collapse, explosions, fires and damaging releases associated with a loss of containment of energy or dangerous substances such as chemicals and petroleum products. These engineering and management skills exceed those required for managing workplace safety as it impacts people, property and the environment.

PSM is a major issue for the industry, with many organisations looking to adopt a more holistic and systematic approach to assuring the integrity of their operations. Center for Chemical Process Safety (CCPS) *Guidelines for risk based process safety (RBPS)* provides such a high-level framework: this and other models are being adopted by some organisations (e.g. PAS 55 and ISO 9001). In addition, PSM may be influenced by legislative requirements (e.g. in the UK The Offshore Installations (Safety Case) Regulations (OSCR) and The Control of Major Accident Hazards (COMAH) Regulations).

Whereas many of the larger organisations have been working on these approaches for a number of years, with significant dedicated resources and varying degrees of success, others and many of the smaller organisations are looking for consistent guidance as they look to achieve efficient development and implementation approaches to achieve effective PSM. One of the first questions asked by many senior executive teams is: how are other people in similar industries addressing this issue?

The objective of EI *High level framework for process safety management (EI PSM framework)* is to provide a simple and systematic approach for organisations large and small across the energy industry, defining the key things organisations need to get right in order to assure the integrity of their operations incorporating technical, maintenance, operational, and human and organisational factors.

EI *PSM framework* should be applicable to both large and small organisations; however, the depth of application will vary in order to be applicable to the scope and complexity of their operations.

1.1 DEVELOPMENT APPROACH

EI *High level framework for process safety management* has been developed by the energy industry for use by energy industry sectors, capturing and incorporating learnings from people with practical experience of developing and implementing PSM as part of an integrated management system (MS).

Two facilitated workshop sessions were held to develop EI *PSM framework*: an initial session to explore the need for a framework and what a high-level framework for process safety management for energy industry sectors in the UK (and EU) should look like. A second workshop was held to develop EI *PSM framework* following review of the output of the first workshop by the PSC and the sanctioning of the framework development as part of the EI's Technical Work Programme.

The workshop participants were process safety specialists from the various energy industry sectors who have either implemented a process safety model (whether CCPS *RBPS* or another) and had some experience to report, or who were at a lower level of maturity such

that they are considering implementing a process safety model.

There were some 20 participants in each of the workshops. Delegates were by invitation only and were drawn from:

- EI PSC members (or colleagues).
- EI Technical Partner companies via other EI committees.
- EI Technical company members and selected EI member companies.
- Various stakeholders (e.g. IChemE Safety and Loss Prevention Subject Group, European Process Safety Centre (EPSC), British Chemical Engineering Contractors Association (BCECA), Association of Electricity Producers (AEP), Health and Safety Executive (HSE), etc).

The first workshop participants supported the need for a PSM framework and identified the following objectives for it:

- provide a vision for PSM;
- define a model for and raise profile of PSM within an organisation;
- define what needs to be in place to maintain a licence to operate;
- help to define roles, responsibilities and accountabilities for PSM;
- easy to understand how to achieve suitable PSM, and
- provide guidance on how to assure high level of PSM.

A report of this workshop was published as *EI Technical workshop proceedings: Initial report – Framework for high-level process safety management*, March 2010.

The second workshop reviewed a draft 'strawman' PSM framework that was developed ahead of the workshop by a PSC sub-group. The updated draft PSM framework generated during the second workshop was reviewed by stakeholders in a consultation exercise, further updated to incorporate pertinent feedback, and approved by the PSC with this publication (*EI PSM framework*) as its deliverable.

1.2 SCOPE AND APPLICATION

EI PSM framework is intended to be applicable worldwide, to all sectors of the energy industry such as petroleum, power, and kindred industries like chemicals. It is designed to address process safety hazards and to be equally suitable for major processing, production and operational facilities through to smaller operations, which may not incorporate processing, such as private power distribution networks, smaller storage facilities and filling stations.

EI PSM framework is not designed to replace existing process safety or health, safety and environmental management systems (HS&EMSs). It sets out what should be covered by an existing MS and as such provides a benchmark for good practice. In cases where an organisation does not have a process safety management system (PSMS) *EI PSM framework* provides a design basis for its development. It is also intended to provide a common basis for the benchmarking of PSMSs.

Where an organisation has a PSMS or an integrated MS incorporating HS&E and PSM they should carry out a gap assessment versus the expectations of each element in order to identify any aspects of the system that need to be enhanced.

The gap assessment should be carried out by element with assigned resources, with appropriate current understanding of the specific subject area being covered. It may be advantageous to appoint an overall coordinator to assure consistency and delivery of the overall assessment.

- The initial assessment should look at each expectation and for each one identify:
- how this is achieved;
 - who is responsible for doing it;
 - who is accountable for ensuring that this is done;
 - any gaps or deficiencies versus the expectations, and
 - what needs to be done to address or close the gap.

When the initial assessment has been completed, the significance of the gaps should be determined and a prioritised plan should be developed to address the identified issues. In some cases there may be a significant programme of work required to upgrade the MS to meet the EI *PSM framework* expectations. In these cases it should be recognised that this upgrade work may go on over many months or even years; if this is the case, it may be appropriate to assign a project manager to apply appropriate project management approaches to see the work through to completion.

EI *PSM framework* also provides a basis for periodic audit to assure compliance. The gap assessment and audit should always be carried out on the basis of evidence rather than opinion to confirm compliance, in all cases asking to be shown evidence that something is being carried out in the way that has been described.

2 OUTLINE OF EI *HIGH LEVEL FRAMEWORK FOR PROCESS SAFETY MANAGEMENT*

The challenge for the process industry is often clearly set out in three statements by chief executives as: ensure we don't hurt anyone; ensure we don't harm the environment; and achieve a certain level of return on capital employed (ROCE).

Typically organisations are very clear about what they need to do to deliver ROCE – maximise income and optimise operating expenditure – typically they are clear about the things they need to get right to ensure that these outcomes are as they require. However, with the safety and environmental targets, quite often things are not so clearly understood. Generally there are good lagging indicators, telling organisations how many incidents or injuries they have had; however, very rarely are there comprehensive leading indicators systematically measuring the factors that determine how likely things are to go wrong and consequently how likely they are to have an incident or injury in the future. All too often when asked how they will achieve their safety and environmental targets and how they will know whether those things are being done, the answers are inconsistent.

EI *PSM framework* sets out clearly what needs to be done to assure the integrity of the operation and helps to define what measures should be in place to know whether those things are being done.

It consists of three levels:

- | | |
|--------------|---|
| Focus areas | These set out the key high level components of the PSM framework. |
| Elements | Within each of the focus areas are a number of elements which set out the key aspects of the operation that organisations need to get right in order to assure their integrity. |
| Expectations | Within each of the elements the expectations define what organisations need to get right in order to meet the intent of each element. |

2.1 PSM FOCUS AREAS

There are four focus areas defining the key high level components of EI *PSM framework*, as described in 2.1.1-2.1.4.

2.1.1 Process safety leadership

This focus area sets out how organisations should define and communicate the level of performance they are prepared to accept and how they should ensure that they put in place the necessary resources to achieve the required level of performance.

2.1.2 Risk identification and assessment

This focus area sets out how organisations should identify and assess the risks that they need to manage in order to assure the integrity of their operations, how they identify the necessary control measures and how they should record and maintain the process safety knowledge developed from these risk identification and assessment activities.

2.1.3 Risk management

This focus area sets out how organisations should implement and manage the control measures that have been identified during their risk identification and assessment activities.

2.1.4 Review and improvement

This focus area sets out how organisations should measure and review their compliance with the EI *PSM framework* expectations and how they should ensure that they learn from these measurements and the findings from investigations.

2.2 PSM ELEMENTS

Within each of the focus areas are a number of elements, 20 in total, which set out the key aspects of operations that organisations need to get right in order to assure the integrity of the operations. Each element contains a number of expectations which set out a more detailed definition of what they need to get right in order to meet the intent of each element.

2.2.1 Process safety leadership

There are five elements within the process safety leadership focus area that set out how organisations should define and communicate the level of performance they are prepared to accept and how they should ensure that they put in place the necessary resources to achieve the required level of performance:

1. Leadership commitment and responsibility.
2. Identification and compliance with legislation and industry standards.
3. Employee selection, placement and competency, and health assurance.
4. Workforce involvement.
5. Communication with stakeholders.

2.2.2 Risk identification and assessment

There are two elements within the risk identification and assessment focus area that set out what organisations should ensure is done to identify and assess the risks that they need to manage in order to assure the integrity of their operations, how they should identify the necessary control measures and how they should record and maintain the process safety knowledge developed from these risk identification and assessment activities:

6. Hazard identification and risk assessment.
7. Documentation, records and knowledge management.

2.2.3 Risk management

There are 11 elements within the risk management focus area that set out the key areas of risk and how organisations should implement and manage the control measures that have been identified during their risk identification and assessment activities:

8. Operating manuals and procedures.
9. Process and operational status monitoring, and handover.
10. Management of operational interfaces.

11. Standards and practices.
12. Management of change and project management.
13. Operational readiness and process start-up.
14. Emergency preparedness.
15. Inspection and maintenance.
16. Management of safety critical devices.
17. Work control, permit to work and task risk management.
18. Contractor and supplier, selection and management.

2.2.4 Review and improvement

There are two elements within the review and improvement focus area that set out how organisations should measure and review their compliance with the expectations of EI *PSM framework* and how they should ensure that they learn from these measurements and the findings from investigations:

19. Incident reporting and investigation.
20. Audit, assurance, management review and intervention.

2.3 PSM EXPECTATIONS

There follow the expectations for each element. Each commences with an overview and contains a number of expectations which set out a more detailed definition of what organisations need to get right in order to meet the intent of each element.

ELEMENT 1 LEADERSHIP, COMMITMENT AND RESPONSIBILITY

- Overview Assurance of the integrity of an organisation's operations requires visible leadership commitment and accountability at all levels of the organisation. Management must establish HS&E and process safety policy, provide perspective, set HS&E and process safety performance targets and provide the structure and resources to achieve them.
- 1.1 A documented HS&E and process safety policy is in place and signed by the chief executive officer (CEO) or the appropriate unit managing director (MD). These are living systems which are regularly reviewed and updated to reflect the needs of the organisation.
- 1.2 HS&E and process safety governance and support arrangements are defined and implemented at all levels from the board through to the workforce.
- 1.3 An HS&E and process safety risk MS is in place which meets applicable legislation, the EI *PSM framework* expectations and other requirements to which the organisation subscribes with regard to its HS&E and process safety activities.
- 1.4 Management establishes the scope, priority and pace for the HS&E and process safety risk MS implementation, considering the complexity and risks involved with their operations and products.
- 1.5 Roles, responsibilities, authorities and accountabilities for the management of HS&E and process safety are known and exercised.
- 1.6 Sufficient competent resources are in place to cover the defined HS&E and process safety roles and responsibilities, in order to reduce the likelihood of overloaded or stressed staff having a detrimental effect which could lead to an incident.
- 1.7 Clear HS&E and process safety objectives, performance targets and action plans are established and performance is regularly evaluated against these.
- 1.8 Required HS&E and process safety leadership attributes are defined, developed and integrated into the required competencies for leaders.
- 1.9 Directors and managers visibly demonstrate personal commitment and accountability for HS&E and process safety, leading by example and upholding core values and standards of the organisation.
- 1.10 Directors and managers promote an open and trusting environment and understand how their behaviours impact others.
- 1.11 Directors and managers maintain an understanding of what is happening in the workplace in order to identify and address key HS&E and process safety issues and improvement opportunities.
-

- 1.12 Directors and managers recognise and reward positive HS&E and process safety behaviours and performance and intervene to correct deviations from required performance at all levels in the organisation.
- 1.13 Managers responsible for organisations operated by others communicate PSM principles to the operator and encourage the adoption of the EI *PSM framework*.
- 1.14 Arrangements for leadership, commitment and responsibility are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 1.15 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 2 IDENTIFICATION AND COMPLIANCE WITH LEGISLATION AND INDUSTRY STANDARDS

- Overview Compliance with legislation is a fundamental requirement for organisations. Management must ensure that the requirements of applicable legislation are identified, understood and complied with.
- 2.1 Requirements of current and forthcoming, applicable legislation, regulations, licences, permits, codes, standards, practices and other governmental requirements are identified, documented and kept current.
- 2.2 The operating requirements arising from legislation and industry standards are defined, documented and communicated to those affected.
- 2.3 Compliance with legislation and industry standards is systematically verified.
- 2.4 Arrangements for identification and compliance with legislation and industry standards are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 2.5 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 3 EMPLOYEE SELECTION, PLACEMENT AND COMPETENCY, AND HEALTH ASSURANCE

- Overview Control of operations depends upon having competent people in position. Management must ensure that existing and new personnel have the required competencies and are fit for work.
- 3.1 The required HS&E and process safety competencies and fitness for work and health monitoring requirements are defined for all roles in the organisation. These competencies address EI *PSM framework* expectations.
- 3.2 A process is in place for screening, selection and placement of employees which confirms their compliance with the specified requirements for the role.
- 3.3 Individual and collective experience and knowledge are maintained and are carefully considered when personnel changes are made.
- 3.4 Roles and responsibilities are realistically designed to take account of human capabilities and limitations and other key human and organisational factors.
- 3.5 Appropriate induction is carried out for personnel taking up a new or revised position.
- 3.6 A staffing development and succession plan is in place for all positions with PSM responsibility.
- 3.7 The organisational structure, and continuity of PSM critical positions, is reviewed annually to ensure that it is adequate to meet the EI *PSM framework* expectations.
- 3.8 Employee competency and fitness for work are regularly assessed against requirements of their assigned role and responsibilities.
- 3.9 Employee training and development needs are identified through a systematic process.
- 3.10 Systematic and effective training and development programmes ensure that each person is competent to understand and accept and deliver against the defined HS&E and process safety responsibilities for their role.
- 3.11 Training and development programmes are a combination of formal courses, coaching and practical work.
- 3.12 Training and development programmes are formally reviewed to assess their effectiveness and identify issues which need to be addressed and improvement opportunities.
- 3.13 Arrangements for employee selection, placement and competency, and health assurance are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 3.14 Compliance and performance trends are reviewed by specified levels of management.
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ELEMENT 4 WORKFORCE INVOLVEMENT

- Overview Achieving the high levels of HS&E and process safety performance requires the commitment of the whole workforce.
Management must align, involve and empower the whole workforce, in the identification and management of HS&E and process safety hazards.
- 4.1 Directors and managers promote an open and trusting environment and understand how their behaviours impact others.
- 4.2 Employees and contractors are actively engaged in the improvement of HS&E and process safety performance and have an understanding of process safety hazards, their identification and management/control.
- 4.3 Directors and managers engage employees and contractors in two-way communication regarding HS&E and process safety policies, objectives, performance targets, action plans and sharing of lessons learned from inside and outside the organisation.
- 4.4 Systematic HS&E and process safety promotion and engagement programmes are in place to continually increase awareness of employees and contractors with regard to HS&E and process safety issues, and contribute to the promotion of a culture of openness, transparency, belief, motivation, individual responsibility, participation and commitment.
- 4.5 Arrangements for workforce involvement are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 4.6 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 5 COMMUNICATION WITH STAKEHOLDERS

- Overview Establishing and maintaining stakeholders' confidence is a key factor in maintaining an organisation's licence to operate. Management must identify key stakeholder groups and develop and maintain a good working relationship with them, understanding and addressing their issues and concerns.
- 5.1 A defined communications system supports the organisation to identify, develop and maintain a good working relationship with the statutory and non-statutory stakeholders about its activities, including emergency response communications.
- 5.2 Organisations ensure and demonstrate that the consultation process with statutory and non-statutory stakeholders is appropriate and proportionate, and follows a defined process.
- 5.3 Appropriate HS&E and process safety information is published in the public domain to demonstrate the organisation's commitment to continually improving its performance.
- 5.4 Effectiveness of programmes for communication with stakeholders is regularly reviewed by specified levels of management.
- 5.5 Arrangements for communication with stakeholders are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 5.6 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 6 HAZARD IDENTIFICATION AND RISK ASSESSMENT

- Overview A fundamental requirement of any HS&E and process safety management system is the identification and assessment of risk. Management must ensure that a comprehensive risk assessment process systematically identifies, assesses and appropriately manages the risks arising from the organisation's operations.
- 6.1 A structured process is applied to identify the hazards and ensure that the risks arising from the organisation's assets and operations are systematically assessed.
- 6.2 Risk control measures are identified and implemented, using the hierarchy of control, to manage the identified risks to a tolerable level.
- 6.3 The tolerable level of risk is defined for all risks (to human health & safety, environmental impact, property and financial loss) and is consistently understood and applied throughout the organisation.
- 6.4 Risk assessments are conducted for:
- ongoing operations;
 - hazardous materials;
 - new projects;
 - products and services, and
 - all changes.
- 6.5 Risk assessments consider risk to:
- health and safety of employees, contractors and members of the public;
 - process safety;
 - environment;
 - reputation;
 - asset integrity;
 - business interruption;
 - security;
 - third party assets, and
 - customers.
- 6.6 Risk assessments consider human and organisational factors.
- 6.7 Risk assessments are carried out by competent personnel with appropriate independence.
- 6.8 Risk assessments take into account learnings from incidents from both inside and outside the organisation.
- 6.9 Completed risk assessments are reviewed, approved and accepted by specific levels of management appropriate to the magnitude of the risk and any decisions are clearly documented.
- 6.10 All stakeholders are kept informed about the risk assessment process and results.
-

- 6.11 The status of risk control measures is reviewed at regular intervals by specified levels of management to ensure risk assessment recommendations are resolved in a timely manner.
- 6.12 The implementation of mitigation recommendations for the top HS&E and process safety risks is reviewed regularly by specified levels of management.
- 6.13 Risk assessments are updated as changes occur and reviewed and updated at a defined appropriate frequency.
- 6.14 Arrangements for hazard identification and risk assessment are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 6.15 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 7 DOCUMENTATION, RECORDS AND KNOWLEDGE MANAGEMENT

- Overview Accurate records and information are essential to identify, assess and manage HS&E and process safety risk. Management must ensure that the information required to support safe operation is identified, available and up to date.
- 7.1 There are procedures to define, develop and maintain the required documentation and records necessary to support robust operation and maintenance of facilities.
- 7.2 Documentation and records are readily available to those who need to use them.
- 7.3 Documentation and records including those kept electronically are appropriately safeguarded.
- 7.4 There are procedures to ensure that documentation and records are regularly reviewed and kept up to date as living systems.
- 7.5 A retention policy is defined for all documentation and records.
- 7.6 The required documentation and records include those generated to meet the requirements of all other EI *PSM framework* expectations, such as:
- process design considerations and basis for safe operation;
 - drawings;
 - asset register;
 - equipment records (inspection, testing, maintenance and modification);
 - equipment specification data;
 - workplace inspection records;
 - work logs;
 - training and competency records;
 - incident investigation reports;
 - occupational health records;
 - operating procedures;
 - environmental authorisations;
 - planning consents;
 - relevant legislation;
 - risk assessments;
 - standards and practices;
 - hazards of materials involved in operations, and
 - product data sheets.
- 7.7 Arrangements for documentation, records and knowledge management are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 7.8 Compliance and performance trends are reviewed by specified levels of management.
-

ELEMENT 8 OPERATING MANUALS AND PROCEDURES

- Overview Operation of facilities within established parameters and according to legislation is an essential aspect of HS&E and process safety. Management must ensure that the operating manuals and procedures required to support operations are identified, available, accurate, up to date, understood and used.
- 8.1 Approved operating manuals and procedures are identified, available, accurate, up-to-date, understood and used, and are commensurate with the operational risk, and include human factors considerations.
- 8.2 Operating manuals are designed to maximise usability and minimise the likelihood of error and non-compliance.
- 8.3 Operating manuals and procedures should provide:
- a clear safe operating envelope (SOE);
 - the steps required to prevent an excursion outside the SOE, and
 - clear instructions on actions to be taken if an excursion outside the SOE occurs.
- 8.4 Operating manuals and procedures are regularly reviewed and updated; these reviews involve supervisors and personnel who are required to use them.
- 8.5 Arrangements for operating manuals and procedures are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 8.6 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 9 PROCESS AND OPERATIONAL STATUS MONITORING, AND HANDOVER

- Overview Comprehensive process and operational status monitoring and effective handover between work groups is essential to assure the continued integrity of the organisation's operations. Management must ensure that the process and operational status monitoring, and handover requirements are defined, understood and carried out.
- 9.1 SOLs are defined for all assets, commensurate with risk.
- 9.2 There are procedures to ensure that SOLs are regularly reviewed and kept up to date as living systems.
- 9.3 Operating parameters are systematically monitored vs. SOLs.
- 9.4 Excursions beyond SOE are identified and followed up.
- 9.5 Arrangement for SOLs and their significance are understood and monitoring requirements are followed; understanding of arrangements and compliance with them is regularly tested.
- 9.6 Handover arrangements are defined, understood and implemented commensurate with risk, covering handovers such as:
– operational and maintenance shift handover;
– successive work groups, and
– job positions (one to another).
- 9.7 Arrangements for process and operational status monitoring, and handover are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 9.8 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 10 MANAGEMENT OF OPERATIONAL INTERFACES

- Overview Operational interfaces with third parties, who provide or receive services, utilities, or products may impact the organisation's operations. Management must ensure that operational interfaces with third parties are identified, assessed and appropriately managed.
- 10.1 Operational interfaces with third parties are identified, documented and risk assessed.
- 10.2 Management arrangements are established proportionate to the risk associated with failure of the operational interface.
- 10.3 Arrangements for management of operational interfaces are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 10.4 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 11 STANDARDS AND PRACTICES

Overview	HS&E and process safety performance is enhanced by using robust standards and safe working practices. Management must ensure that the required standards and safe working practices, to support project, maintenance and operational activities, are identified, developed and consistently applied.
11.1	Design, inspection and maintenance standards are defined, which bring together legislative requirements, industry standards and the organisation's good practices into a clear set of guidelines to be used when developing projects, inspection and maintenance plans.
11.2	Safe working practices are defined, which bring together legislative requirements, industry and the organisation's good practices into a clear set of guidelines to be used when developing construction, inspection and maintenance plans and method statements, and for operational activities.
11.3	Standards and practices: <ul style="list-style-type: none">– meet or exceed applicable legislative requirements;– embody responsible requirements where legislation does not exist, and– address other important considerations including human factors.
11.4	Approved standards and practices are reviewed, to take into account changes to legislation, industry standards, industry and the organisation's good practices and findings from incidents, and are regularly reviewed and kept up to date as living systems.
11.5	Approved standards and practices are readily available to those who need them, including contractors.
11.6	Authority to approve standards and practices is formally assigned to specific named competent individuals.
11.7	Deviation from design standards is permitted only after assessment, review and approval by specific named competent individuals and after the rationale for the decision is documented.
11.8	Procedures are in place to routinely monitor to ensure that facilities and materials received meet design standards and that construction is in accordance with applicable design standards and safe working practices.
11.9	When a new or updated standard or practice is issued, the requirements for retrospective application are defined.
11.10	Arrangements for standards and practices are understood and followed; understanding of arrangements and compliance with them is regularly tested.
11.11	Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 12 MANAGEMENT OF CHANGE AND PROJECT MANAGEMENT

- Overview The introduction of any form of change into an organisation, if not appropriately managed, can significantly increase the levels of HS&E and process safety risk.
Management must ensure that risks arising from any form of change are systematically identified, assessed and managed.
- 12.1 A process is in place which systematically identifies, assesses and manages the risks arising from both temporary and permanent changes.
- 12.2 The processes for managing change address:
- authority for approval of changes;
 - compliance with legislation and approved standards;
 - acquisition of needed permits;
 - documentation, including reason and technical basis for change;
 - communication of risks associated with the change, and
 - mitigation measures, such as: time limitation; training.
- 12.3 Management of change addresses changes to:
- assets or equipment;
 - operations or operating procedures;
 - products, materials or substances;
 - organisation or personnel;
 - software or control systems;
 - designs or specifications;
 - standards or practices, and
 - inspection, maintenance or testing programmes.
- 12.4 Management of change considers impacts to:
- health and safety (including process safety);
 - environment;
 - reputation;
 - security;
 - third party assets, and
 - business interruption.
- 12.5 Management of change considers human and organisational factors.
- 12.6 Temporary changes do not exceed initial authorisation for scope or time without review and approval.
- 12.7 Changes are approved by specified named competent individuals commensurate with the risk associated with the proposed change.
- 12.8 Pertinent records covering all changes are maintained.
- 12.9 Project management procedures are documented, well understood, readily available to those who need to use them (including contractors) and executed by qualified personnel.
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- 12.10 Key stages in the project development lifecycle are reviewed and approved by specified level of management with due consideration of PSM practices.
- 12.11 Criteria are established and procedures are in place for conducting and documenting risk assessments at specific project stages to confirm the integrity of new assets and existing assets which have been substantially modified.
- 12.12 HS&E and process safety impacts of new business development on the local community are assessed and communicated to relevant authorities and integrated into the business case.
- 12.13 The design and construction of new or modified facilities use approved standards and practices that:
- meet or exceed applicable regulatory requirements;
 - embody responsible requirements where legislation does not exist, and
 - encompass robust PSM practices.
- 12.14 A pre-commissioning review is performed and documented to confirm that:
- construction is in accordance with specifications;
 - EI *PSM framework* measures are in place;
 - risk management recommendations have been addressed and required actions taken;
 - regulatory and permit requirements are met;
 - emergency, operations and maintenance procedures are in place and adequate;
 - required training of personnel and communication related to PSM aspects has been accomplished, and
 - necessary project documentation (safety file) is readily available to those who need to use it.
- 12.15 Procedures are in place to identify and manage the HS&E and process safety risks arising from the mothballing and decommissioning or disposal of assets including dismantling, demolition and site remediation.
- 12.16 Arrangements for management of change and project management are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 12.17 Compliance and performance trends are reviewed by specified levels of management.
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ELEMENT 13 OPERATIONAL READINESS AND PROCESS START-UP

- Overview The commissioning and start-up of new, modified or existing plant and equipment is a high risk operation. Management must ensure that there is a systematic process to verify that plant and equipment is in a safe condition, and that personnel are appropriately prepared, before start-up or return to normal operation.
- 13.1 There is a systematic process for checking operational readiness and the integrity of systems before they are brought into service.
- 13.2 The checking process addresses:
- new or modified plant and equipment;
 - return from maintenance, and
 - restart following system or full plant trip or planned shutdown.
- 13.3 There are defined criteria for operational readiness reviews and they are regularly reviewed and updated.
- 13.4 The criteria cover:
- hardware;
 - control system and software;
 - human and organisational factors;
 - operating procedures, and
 - documentation.
- 13.5 System checks are carried out and documented by competent personnel.
- 13.6 There are defined criteria for categorising and handling identified issues and outstanding work items.
- 13.7 Completed system checks are reviewed, approved and accepted by specific levels of management appropriate to the magnitude of the risk.
- 13.8 Commissioning and start-up procedures have defined stages, hold/check points and progression criteria and review authorities.
- 13.9 Arrangements for operational readiness and process start-up are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 13.10 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 14 EMERGENCY PREPAREDNESS

Overview	The consequences of an incident can be significantly reduced if the organisation is appropriately prepared to handle potential emergency situations. Management must ensure that, in the event of an incident, the organisation is appropriately prepared for all necessary actions which may be required for the protection of: the public; the organisation's and contractors' personnel; the environment; plant and equipment, and the organisation's reputation.
14.1	Required emergency procedures are identified commensurate with identified credible emergency scenarios.
14.2	Effective emergency plans, including and involving external emergency services and general public, are in place.
14.3	Emergency response plans (ERPs) are documented, accessible and clearly communicated. The plans based on assessed HS&E and process safety risks cover: <ul style="list-style-type: none">– response organisation structure;– defined roles and responsibilities;– internal and external communication procedures;– procedures for accessing and mobilising personnel and equipment;– procedures for interfacing with other organisations and external emergency response organisations;– public relations, and– recovery and remediation.
14.4	There are arrangements to ensure that specified levels of management regularly review ERPs, using findings from drills and incidents to identify and address issues and opportunities for improvement, so that they are kept up to date as living systems.
14.5	Equipment and facilities needed for emergency response are defined and readily available and maintained.
14.6	Adequate numbers of competent personnel are available to fulfil the defined roles in the emergency plans.
14.7	Mutual aid schemes involving relevant third parties and external emergency services are established and agreed as appropriate.
14.8	A regular programme of drills involving internal and external resources is used to exercise, develop and improve capabilities for a range of emergencies.
14.9	Arrangements for emergency preparedness are understood and followed; understanding of arrangements and compliance with them is regularly tested.
14.10	Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 15 INSPECTION AND MAINTENANCE

- Overview Maintaining the integrity of plant and equipment is an essential requirement for HS&E and process safety. Management must ensure that the necessary inspection and maintenance requirements are identified and carried out to reduce the likelihood of a significant incident as a result of failure of plant or equipment.
- 15.1 Assets are uniquely identified on an asset register which provides up-to-date asset lists and equipment records, including location and equipment specification data. The asset register provides a basis for inspection and maintenance planning.
- 15.2 The asset inspection and maintenance programmes are risk based and address and integrate long term asset integrity, HS&E and process safety compliance assurance.
- 15.3 There are procedures to ensure that asset inspection and maintenance programmes are reviewed regularly commensurate with risk, using findings from the programmes, industry experience and incidents to identify and address issues and opportunities for improvement, so that they are kept up to date as living systems.
- 15.4 Feasible plans and schedules are developed for execution of asset inspection and maintenance programmes.
- 15.5 Adequate numbers of competent personnel are available to carry out the inspection and maintenance programmes.
- 15.6 There are procedures to ensure that findings and recommendations from the asset inspection and maintenance programmes are appropriately prioritised and followed up.
- 15.7 Inspection and maintenance programmes are approved by specific named competent individuals.
- 15.8 Deviations from approved inspection and maintenance programmes are approved by specified named competent individuals commensurate with the risk.
- 15.9 Arrangements for inspection and maintenance programmes are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 15.10 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 16 MANAGEMENT OF SAFETY CRITICAL DEVICES

- Overview An essential requirement for HS&E and process safety is that safety critical equipment and devices (SCDs) are in service and operating correctly. Management must ensure that safety critical equipment and devices are identified and appropriately managed, so that they are in service and functioning correctly.
- 16.1 SCDs are uniquely identified on an asset register which provides up-to-date asset lists and equipment records, including location and equipment specification data. The asset register provides a basis for the planning of SCD testing, inspection and maintenance.
- 16.2 SCD testing, inspection and maintenance programmes are in place. There are defined standards and the programmes are proportionate to the risk associated with failure of the SCDs.
- 16.3 There are procedures to ensure that SCD testing, inspection and maintenance programmes are reviewed regularly commensurate with risk, using findings from the programme, industry experience and incidents to identify and address issues and opportunities for improvement, so that they are kept up to date as living systems.
- 16.4 Feasible plans and schedules are developed for execution of testing, inspection and maintenance programmes.
- 16.5 Adequate numbers of competent personnel are available to carry out the testing, inspection and maintenance programmes.
- 16.6 There are procedures to ensure that findings and recommendations from the SCD testing, inspection and maintenance programmes are appropriately prioritised and followed up.
- 16.7 There are procedures to ensure that temporary disarming or deactivation of critical alarm, control, shutdown, security and emergency response equipment is managed and recorded.
- 16.8 SCD testing, inspection and maintenance programmes are approved by specified named competent individuals.
- 16.9 Disarming, deactivation or by-passing of SCDs is reviewed and approved by specified named competent individuals commensurate with the risk.
- 16.10 Arrangements for management of SCDs are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 16.11 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 17 WORK CONTROL, PERMIT-TO-WORK AND TASK RISK MANAGEMENT

- Overview The execution of maintenance and project work activities, if not appropriately managed, can significantly increase the levels of HS&E and process safety risk.
Management must ensure that effective work control, permit to work and task risk management arrangements are in place, and followed, to control the risks arising from work activities.
- 17.1 Appropriate work control and permit-to-work arrangements, proportionate to the risk, are employed to assure the safety of personnel, plant, process and the integrity of the asset during work activities.
- 17.2 Key stages in the work control arrangements are reviewed and approved by specified levels of management.
- 17.3 Permit-to-work systems, proportionate to the risk, are employed to ensure both the safety of personnel and the integrity of the asset during maintenance or project work activities.
- 17.4 There are procedures that ensure that HS&E and process safety risks arising from work tasks are systematically identified and assessed, before work starts and as circumstances change and where new risks arise during execution of work.
- 17.5 Risk control measures are identified and implemented to manage the identified risks to a tolerable level.
- 17.6 Task risk assessments consider risk to:
- health and safety of employees, contractors and members of the public;
 - process safety;
 - environment;
 - reputation, and
 - business interruption.
- 17.7 Completed task risk assessments are reviewed and approved by specified named competent individuals appropriate to the magnitude of the risk and any decisions are clearly documented.
- 17.8 All of the workgroup are made aware of task risk assessments and required control measures, process and results.
- 17.9 Adequate numbers of competent personnel are available to carry out the required work control, permit-to-work and task risk management arrangements.
- 17.10 Arrangements for work control, permit-to-work and task risk management are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 17.11 Compliance and performance trends are reviewed by specified levels of management.
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ELEMENT 18 CONTRACTOR AND SUPPLIER, SELECTION AND MANAGEMENT

- Overview Third parties doing work on the organisation's behalf may impact its operations and its reputation. Management must ensure that third parties perform in a manner that is consistent and compatible with the organisation's HS&E and process safety requirements.
- 18.1 There is a process to ensure that third party services are evaluated and selected against criteria that include an assessment of capabilities to perform work in a robust manner and meet the organisation's HS&E and process safety performance expectations.
- 18.2 HS&E and process safety performance evaluation criteria are defined for third parties. Contractor and supplier compliance with legislation is a minimum requirement. The evaluation criteria are aligned to the EI *PSM framework* expectations.
- 18.3 All contractors are inducted and appropriately informed/trained on relevant organisation procedures and practices, and the specific hazards associated with any work they undertake. Impacted organisation personnel are briefed on and understand the risks arising from the contractors' activities and the necessary support or control measures. Specific focus is given to emergency procedures.
- 18.4 Effective organisational, communication and control arrangements are in place between organisation personnel and contractor personnel to manage the risks effectively.
- 18.5 Third party performance (in particular against required performance criteria) is routinely monitored and assessed, feedback is provided, and non-conformities are corrected.
- 18.6 Adequate numbers of competent personnel are available to carry out the required contractor and supplier, selection and management arrangements.
- 18.7 Arrangements for contractor and supplier, selection and management are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 18.8 Compliance and performance trends are reviewed by specified levels of management.

ELEMENT 19 INCIDENT REPORTING AND INVESTIGATION

- Overview An essential aspect of HS&E and process safety performance improvement is learning from incidents and 'near hits' and taking appropriate action to prevent their recurrence. Management must ensure that incidents and 'near hits' are consistently reported and investigated and that identified actions and learnings are implemented on a timely basis.
- 19.1 A system is in place for incident reporting, investigation, follow-up and capturing lessons learned from incidents and near hits including:
- injury to people;
 - work causal ill health;
 - environment incidents;
 - damage to assets;
 - loss of process containment;
 - energy release;
 - demands on SCDs, and
 - business interruption.
- 19.2 The reporting of incidents and near hits by all personnel including contractors and suppliers is obligatory.
- 19.3 Incidents and near hits are classified and investigated on the basis of actual and potential outcome.
- 19.4 Incidents and near hits are investigated on a timely basis.
- 19.5 Investigations identify root causes, including human and organisational factors, and recommendations to address them are identified.
- 19.6 Effective arrangements are in place to ensure that incidents or near hits are appropriately investigated when they involve contractor or supplier personnel.
- 19.7 There are processes in place to learn from relevant incidents and near hits, and good practices in other organisations and sectors.
- 19.8 Adequate numbers of competent personnel are available to carry out the required investigation arrangements.
- 19.9 Completed investigations are reviewed and approved by specific levels of management appropriate to the classification of the incident.
- 19.10 Where appropriate and recognising legal and security constraints all stakeholders are kept informed about the findings and recommendations from investigations.
- 19.11 Recommendations are tracked to completion.
- 19.12 Senior management periodically reviews the effectiveness of corrective and preventative actions.
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- 19.13 Arrangements for incident reporting and investigation are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 19.14 Compliance, HS&E and process safety incident statistics and performance trends are reviewed by specified levels of management.

ELEMENT 20 AUDIT, ASSURANCE, MANAGEMENT REVIEW AND INTERVENTION

- Overview Regular review and audit of compliance with the EI *PSM framework* is vital to ensure that HS&E and process safety performance continues to meet the defined targets.
Management must ensure that there is both routine review and independent audit of compliance with EI *PSM framework* expectations.
- 20.1 EI *PSM framework* performance measures are established to monitor the degree to which the EI *PSM framework* expectations are being complied with.
- 20.2 The organisation's operations are routinely monitored, incorporating the PSM performance measures, and reviewed, by specified levels of management, at predetermined frequencies.
- 20.3 The EI *PSM framework* expectations are reviewed annually and updated as necessary to ensure that they continue to meet the needs of the organisation.
- 20.4 Audit criteria are defined to provide a consistent basis for audit and a consistent basis for development of the audit opinion.
- 20.5 A routine internal (2nd party) audit programme is in place with audits carried out by personnel from the organisation. The audit assesses compliance with the EI *PSM framework* expectations and the effectiveness of the management review arrangements.
- 20.6 A routine external (3rd party) audit programme is in place with audits carried out by personnel independent of the organisation. The external audit assesses and provides an independent opinion on compliance with the EI *PSM framework* expectations and the effectiveness of the management review arrangements.
- 20.7 Assessments are conducted by trained, competent multidisciplinary teams, including HS&E and process safety professionals and personnel with operational and technical expertise.
- 20.8 The frequency and scope of the assessments will reflect the complexity of the operation, the level of risk and previous EI *PSM framework* compliance history.
- 20.9 Audit opinion and findings from the EI *PSM framework* audits are reviewed with specified levels of management.
- 20.10 The effectiveness of the EI *PSM framework* audit arrangements is periodically reviewed and the findings are used to make improvements.
- 20.11 Necessary interventions to correct identified issues, non compliances and deviations in performance, beyond defined tolerance levels, are identified, appropriately prioritised, scheduled and tracked to completion.
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- 20.12 Arrangements for audit, assurance, management review and intervention are understood and followed; understanding of arrangements and compliance with them is regularly tested.
- 20.13 Compliance and performance trends are reviewed by specified levels of management.

ANNEX A GLOSSARY

A.1 INTRODUCTION

For the purpose of this publication the interpretations in A.2 apply irrespective of the meaning they may have in other connections.

A.2 GLOSSARY OF ABBREVIATIONS

AEP	Association of Electricity Producers
BCECA	British Chemical Engineering Contractors Association
CCPS	Center for Chemical Process Safety
CEO	chief executive officer
COMAH	The Control of Major Accident Hazards [Regulations]
CSR	corporate social responsibility
EI	Energy Institute
EPSC	European Process Safety Centre
ERP	emergency response plan
EU	European Union
HASAWA	Health and Safety at Work etc Act
HSE	Health and Safety Executive
HS&E	health, safety and environment
HS&EMS	health, safety and environmental management system
IChemE	Institution of Chemical Engineers
ISRS	International Safety Rating System
JV	joint venture
MD	managing director
MS	management system
OHSAS	Occupational Health and Safety Management System
OSCR	The Offshore Installations (Safety Case) Regulations
PSC	Process Safety Committee
PSM	process safety management
[EI] <i>PSM framework</i>	[EI] <i>High level framework for process safety management</i>
PSMS	process safety management system
[CCPS] <i>RBPS</i>	[CCPS] <i>Guidelines for risk based process safety</i>
ROCE	return on capital employed
SCD	safety critical equipment and device
SOE	safe operating envelope
SOL	safe operating limit
UK	United Kingdom

ANNEX B REFERENCES

CENTER FOR CHEMICAL PROCESS SAFETY (CCPS) www.aiche.org/ccps

Guidelines for risk based process safety (RBPS) (April 2007).

BRITISH STANDARDS INSTITUTION (BSI) www.bsi-global.com

PAS 55 *Asset management* (2008).

OHSAS 18001 *Occupational health and safety management systems. Requirements* (July 2007).

ENERGY INSTITUTE (EI) www.energyinst.org

Technical workshop proceedings: Initial report – Framework for high-level process safety management (March 2010).

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) www.iso.ch

ISO 9001 *Quality management systems - Requirements* (2008).

OFFICE OF PUBLIC SECTOR INFORMATION (OPSI) www.opsi.gov.uk

Health and Safety at Work etc Act 1974 (HASAWA).

The Control of Major Accident Hazard Regulations 1999 (SI 1999/743) (as amended) (COMAH).

The Offshore Installations (Safety Case) Regulations 2005 (SI 2005/3117) (OSCR).

DET NORSKE VERITAS (DNV) www.dnv.com

International safety rating system (ISRS).



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Energy Institute Process safety survey (EIPSS)

Benchmark your company against
EI High level framework for process safety management

The EI Process safety survey (EIPSS) enables your organisation to:

1. Understand its vulnerability to having a major incident.
2. Identify the location and scale of any gaps in your organisation's arrangements for HS&E and process safety management.
3. Demonstrate compliance to stakeholders.
4. Highlight areas of good performance.
5. Identify areas where improvement is required.

The EIPSS is a web-based tool to assist senior executives and managers in high hazard industries to understand how well risks are being identified and managed within the organisation, which if not appropriately managed could result in a major incident. The EIPSS will help identify risks which may threaten people, environment, reputations, financial performance and the future of your organisation.

Why do you need the EIPSS?

Recent incidents have demonstrated that, in addition to the immediate human, environmental and financial costs, there have been:

- Escalating effects upon the reputations of companies, their senior executives and the industry as a whole.
- Increased scrutiny by the regulators and governments.
- Impacts upon the share prices of the involved companies, causing investors to question the security of their investments in the high hazard industries.

Maintaining the future integrity of your business

The challenge for any organisation is to be able to confidently answer the question 'how likely are we to have a process safety incident?' Consistent self-assessment using the EIPSS against the expectations defined in the *EI High level framework for process safety management (PSM framework)* will enable your organisation to answer this, by determining whether you have good HS&E and process safety management practices in place.

EIPSS key features

Real time information

Online self-assessment and real-time benchmarking facility based on the elements and expectations of the *EI PSM framework*.

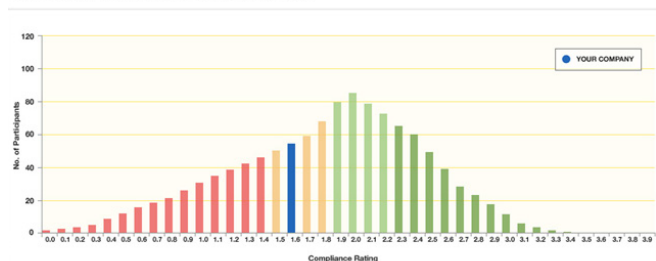
Self-assessment

EIPSS assesses defined arrangements and the effectiveness of their implementation. It provides an opportunity to assess the status of individual elements and expectations.

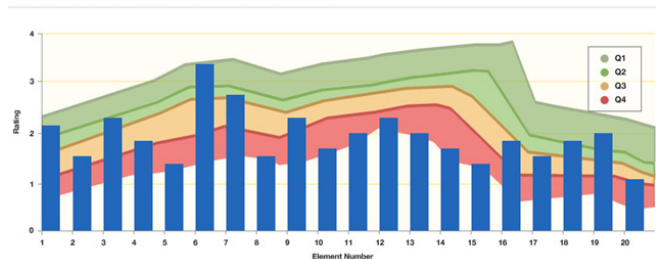
Compliance benchmarking

Results of self-assessments provide the basis for benchmarking of the level of compliance across the survey participants.

Overall - Compliance Rating > Peer Group - All Industries



Overall performance by Element > Peer Group - All Industries



Anonymity assurance

Anonymity of the data relating to individual participants.

Benchmarking across multiple sites

Companies with multiple sites can request reports to provide internal benchmarking across their operating locations.

Applicable to any major hazard installations:

- Oil and gas installations (both upstream and downstream).
- Chemical manufacturing and storage plants
- Power generation plants.
- Energy distribution networks.
- LNG, LPG and CCS installations.

Join the EIPSS

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For further information visit www.energyinst.org/process-safety-survey, or to join the EIPSS please contact Stuart King t: +44 (0)20 7467 7163 or e: sking@energyinst.org.