Guidance on managing process safety in decommissioning projects

energy institute

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FOREWORD

This document has been produced by Atkins Limited on behalf of the Energy Institute (EI). It is intended to provide useful guidance on managing process safety in decommissioning projects in the energy sector generally, with additional guidance for the offshore and onshore oil and gas, petrochemical and thermal power station sectors.

Although it is anticipated that this publication will assist those involved in decommissioning projects, the information contained in this publication is provided as guidance only. While every reasonable care has been taken to ensure the accuracy of its contents, the EI and the technical representatives listed in the Acknowledgements cannot accept any responsibility for any action taken, or not taken, on the basis of this information. The EI shall not be liable to any person for any loss or damage that may arise from the use of any of the information contained in any of its publications.

Whilst written in the context of the United Kingdom (UK) legislative and regulatory framework, the principles set out in this publication can similarly be applied in other countries, provided national and local statutory requirements are complied with. Where the requirements differ, the more stringent should be adopted.

The above disclaimer is not intended to restrict or exclude liability for death or personal injury caused by own negligence.

Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR.

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1 INTRODUCTION

1.1 BACKGROUND

The number of facilities in the energy sector that are coming to the end of their operating life and are likely to be decommissioned in the coming years is increasing, not only due to their age but also to inefficient plants and processes, operating costs, changes in technology and more demanding environmental regulations.

This will place a greater demand on organisations within the energy sector that may be involved in the decommission of these facilities, including facility owners and operators, regulators, contractors and others in the decommissioning supply chain. A key objective for all involved in decommissioning will be to do so safely, and in particular without major accidents occurring with the potential for injuries or fatalities.

Unlike major investment projects where there is clear potential for value creation, decommissioning will generally involve a significant commitment of capital and other resources without, in most cases, adding any revenue value to a company's business. To some extent, decommissioning is largely concerned with managing a company's liabilities and so there may be a temptation to do it at as low a cost as possible. This can be constraining for those tasked with leading and managing decommissioning projects.

Incidents such as the structural collapse at the Didcot A power station in the UK in February 2016, in which four workers were killed (see Figure 1), provide a stark reminder that the need for effective management of process safety within the energy sector does not end when the plant stops operating.

Figure 1: Didcot A power station collapse. UK – 2016 (reproduced with kind permission of PA images)

In recognition of both the likely increase in decommissioning activity and the obligation on all involved to see that it is undertaken with the utmost consideration given to the safety of those exposed to associated hazards, the EI has commissioned this guidance document for managing process safety in decommissioning projects.

The EI defines process safety as:

> *'a blend of engineering and management skills focused on preventing catastrophic accidents and near misses, particularly structural collapse, explosions, fire and toxic releases associated with 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.'*

The requirement in high hazard sectors of the energy industry is to have robust systems in place for managing major accident hazards (MAHs) such as loss of containment, fire, explosion, structural collapse, etc. This applies across the life cycle of a facility from concept, through design and construction, and into the long-term operation of the facility. However, plant operators may have less corporate experience and fewer systems in place for managing process safety when it comes to plant decommissioning.

1.2 DEFINITIONS

The following definitions apply within this guidance document:

Cold suspension/cold stack – frequently applied in the offshore sector, this term refers to the period when an installation or subsea facility has gone through its final shutdown. Any wells will have been permanently plugged and abandoned. All process equipment will have been cleaned and will be ready for disconnection, dismantling and removal.

Decommissioning – includes all the activities related to taking equipment out of service: isolating; cleaning; disconnecting; dismantling; removing; demolishing and disposal. It does not include mothballing or reusing.

Final shutdown – refers to the point at which the facility has stopped producing or operating with no intention to recommission in the future.

Hazard – the intrinsic property of a dangerous substance or physical situation, with a potential for creating damage to human health or the environment.

Human factors – refer to environmental, organisational and job factors, and human and individual characteristics, which influence behaviour at work in a way that can affect health and safety.

Process safety – a blend of engineering and management skills focused on preventing catastrophic accidents and near misses, particularly structural collapse, explosion, fire and toxic release associated with 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.

Major accident – an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation and leading to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment, and involving one or more dangerous substances. Note that this is the

legal definition for a major accident taken from the UK Control of Major Accident Hazards (COMAH) Regulations.

Note also that for the UK offshore sector, a legal definition of a major accident is given in the 2015 Safety Case Regulations (SCR 2015).

Making safe – the process of cleaning, freeing equipment of hydrocarbons, disconnection and physical isolation, and waste management. In relation to pipelines, this involves depressurising them and removing any hydrocarbons. Then the pipelines are cleaned and purged, with the cleaning programme based on the specific needs of the system. This may involve the use of pigs, which are maintenance tools used to clean or inspect the insides of pipelines.

Safety Critical Element/Equipment (SCE) – any structure, plant, equipment, system (including computer software) or component part whose failure could cause, or contribute substantially to, a major accident is safety critical, as is any that is intended to prevent or limit the effect of a major accident. In the UK, the term Safety and Environmental Critical Element (SECE) has been established under the 2015 Safety Case Regulations. This extends the SCE definition to include equipment or systems intended to prevent or limit a major environmental accident or whose failure could cause a major environmental accident.

Warm suspension/warm stack – the facility will have gone through final shutdown, but the process systems will not have been fully isolated and cleaned.

1.3 TERMINOLOGY USED IN THE DOCUMENT

Further to the definitions presented in 1.2, clarification is also given in this section on terminology that has been used in this guidance document to ensure the reader understands the context of certain terms used.

1.3.1 Use of the terms health, safety and environment (HS&E), safety and process safety

In this document, where there is a broader relevance or significance, reference is frequently made to HS&E and safety, as well as to process safety. In general, where this is done and there is no specific mention of process safety, it can be assumed that this is implicit within the reference to HS&E or safety.

Note that as is stated in the abbreviations in section 6, where HSE has been used, this refers to the UK Health and Safety Executive.

1.3.2 Use of the terms 'stage' and 'phase'

To avoid confusion, where the terms project stage or stage have been used, it is in relation to the physical decommissioning activities executed at the site, such as 'cleaning and isolation' or 'dismantling/disconnection'. Further discussion on project stages is given in 4.1.

This is distinct from 'project phase', which is defined as follows:

Where project phase or phase have been used, it is in the context of the project work in support of the decommissioning programme itself, including 'initiate', 'select and develop', 'project engineering' and 'execute', which are discussed in further detail in section 3.

1.3.3 Use of the terms SCE and SECE

The definition for an SCE is given in 1.2. However, in the UK offshore sector, the Safety Case Regulations now extends this to SECE. This brings within this definition any equipment or systems intended to prevent or limit a major environmental accident or whose failure could cause a major environmental accident. Generally, the term SCE has been used throughout this document, but when using the guidance in the context of the UK offshore sector, the wider SECE definition should be applied.

1.3.4 Use of the term ALARP

ALARP is short for 'as low as reasonably practicable'. This involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which workplace risks should be controlled. It is a regulatory requirement in the UK. However, in other countries where it is not recognised in law, this approach to managing risk may be seen as representing good practice. The term is used in this guidance document, so the reader should consider whether its application is a regulatory requirement or would be an implementation of good practice.

1.3.5 Document structure

This guidance document is set out in the following sections:

The background to the guidance document, along with definitions and clarification on terminology, is presented in section 1.

The aspects of decommissioning that this document is intended to address and the energy sectors it focuses on, together with how the guidance should be applied, are presented in section 3.

As this guidance is intended to be a useful reference to process safety professionals and others who may be tasked with HS&E responsibilities during a decommissioning project, Section 3 has been included to provide support on key process safety related considerations at various points in the project life cycle, from initial project set-up through to final decommission and removal.

Generic guidance on several areas identified as key in the EI workshops on process safety in decommissioning is presented in section 4. Guidance that is specific to thermal power stations is included in Annex B, the onshore oil and gas and petrochemical sector is covered in Annex C and the offshore sector in Annex D.

Abbreviations are presented in Annex E and documents referenced in the document are presented in Annex F.

The EI has published a *High level framework for process safety management* which is relevant to this guidance document. For this reason, aspects of the Framework that are specifically relevant to decommissioning have been identified and presented (with minor text changes as appropriate) in Annex A.

2 SCOPE AND APPLICATION

2.1 SCOPE

In September 2016, the EI convened two workshops on managing process safety in decommisioning projects: one for onshore facilities, which had representatives from the conventional power generation, petroleum refining and bulk storage sectors, and an offshore workshop, which had representatives from the upstream oil and gas sector.

The workshops comprised scene-setting presentations that shared knowledge, experience and challenges between the delegates and structured discussion sessions, which focused on key process safety in decommissioning issues. The workshop proceedings were written up in the *Technical workshop proceedings: Process safety in decommissioning projects* (1st edition).

From the workshops, it was concluded that there was a requirement to develop guidance on managing process safety in decommissioning projects within the energy sector. It was proposed that the guidance should focus on some common core issues and address:

– project management;
– the stages of a decommissioning project (from late-life operations through to dismantle/demolish and removal);
– communication with stakeholders;
– interaction with regulators and compliance with legislation and industry/company standards;
– determining and managing the hazard profile, and
– managing people.

This publication is intended to provide guidance on managing process safety within decommissioning projects generally within the energy sector, with more specific guidance and information provided, where possible, in the following industry sectors:

– offshore oil and gas;
– onshore oil and gas and petrochemicals, and
– thermal power generation.

In keeping with the EI's definition of process safety (see 1.2), this guidance focuses on managing process safety in the context of prevention and mitigation of higher consequence events. For this reason, occupational safety is not addressed in detail but is covered briefly where considered appropriate.

This guidance has not been developed for application within the nuclear sector, for which radiological hazards would be the dominant consideration.

This guidance is intended to support those with direct and indirect responsibilities for managing process safety, or with wider health and safety responsibilities, on a decommissioning project. The guidance does not address the following:

– disposal, decontamination and reinstatement of the site and ongoing surveillance;
– planning for decommissioning during the early design of a facility;
– mothballing, and
– reuse.

2.2 APPLICATION

This publication is intended as a guide for managing process safety in the decommissioning of facilities in the offshore and onshore oil and gas, petrochemical and conventional thermal power station sectors.

The document should be used to inform and guide the reader on core common issues that are of relevance to the management of process safety during the decommissioning life cycle. It is not intended to provide an exhaustive or prescriptive guide, but instead should provide a road map for process safety management through the identification of key issues to be considered. It also provides guidance on how to address those issues and includes details of further relevant reference material. It should, therefore, be used alongside other industry information sources available on decommissioning and process safety.