Guidelines for life extension of offshore installations

GUIDELINES FOR LIFE EXTENSION OF OFFSHORE INSTALLATIONS

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1 INTRODUCTION

1.1 BACKGROUND

Worldwide, many offshore installations are due to exceed, or have already exceeded, their design or original anticipated service life as operators use them for longer than expected. Operating older installations can be profitable to companies, depending on the oil price, production efficiency and operating expenditure, and defers the costs of decommissioning. Many installations are using original infrastructure to serve a continued requirement for production from the original fields, or as the base for neighbouring subsea completions.

When oil prices are low, high level business drivers dictate the case for continuing to operate. Executives, shareholders and markets seek forecasts and assurance of future production capacity and the worth of further investment. Business, regulatory and reputational risks in continuing to operate older assets need to be assessed and managed.

Companies and investors require confidence that an installation is capable of maintaining sufficient production integrity, safety and environmental protection for a specified period. The key requirement is the sustained availability and reliability of the critical systems for safety and production and the management of the cumulative risks from ageing.

Many installations had a design specification for a nominal design life of about 20 to 25 years, consistent with initial predictions of the producing life of the field. The concept of 'life extension beyond original anticipated service life' is where operating service life can be continued for a further period without a reduction in margins below safe limits. *Managing the change or transition from the end of design or original anticipated service life to a period of life extension is a process that requires special treatment and planning* [OGUK, 2012].

The technical and business cases for continuing operation are interdependent and need to be developed in parallel. The business case requires input from the technical case in terms of the predicted future expenditure required to operate safely and maintain production efficiency. Late field life tends to be characterised by falling production, lower yields and rising operating expenditure. Figure 2 shows production volume versus operating costs for a typical installation and highlights the decreasing margins for profitable production.

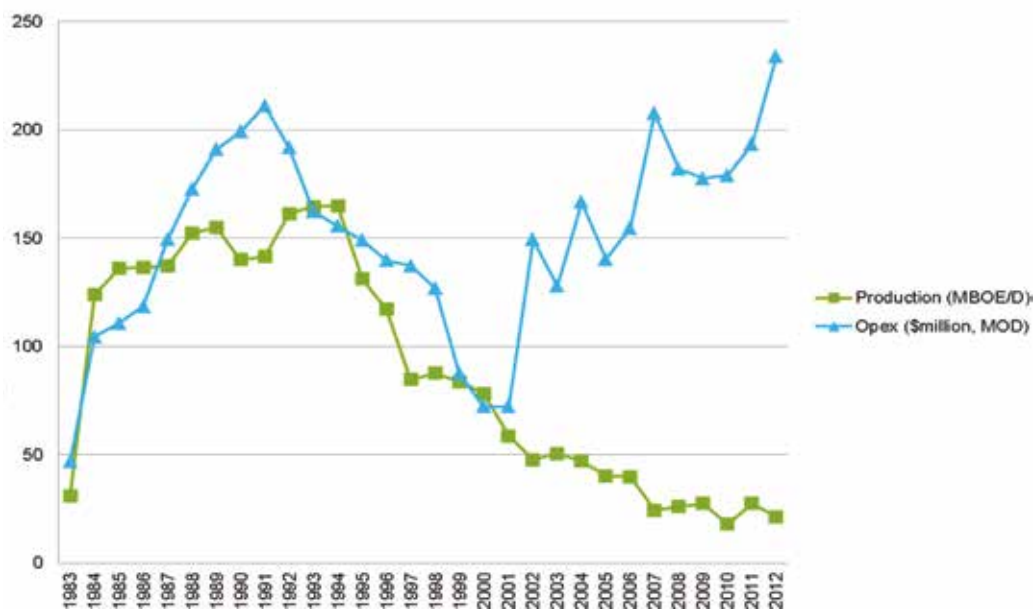

Figure 2: Production volume versus operating costs for a typical installation

1.2 APPROACHES TO LIFE EXTENSION

The technical case for continued operation is best made from an in-depth *Life Extension Review.* The main aims of the review are (a) to determine potential issues that could be life limiting and evaluate the remnant life, (b) to predict the need and costs for refurbishment/ replacement, (c) to foresee and mitigate whole-life obsolescence, and (d) to develop an action plan to address the gaps identified. The review should anticipate changes likely during the future life of the installation and consider issues likely to arise during decommissioning.

Over time, the operations, processes, infrastructure, safety systems and other facilities comprising the installation are subject to ageing with potential impact on safety, productivity, availability, functionality and long-term fitness-for-service. The effects of ageing can be managed through planned inspection, maintenance, repair, replacement, and upgrading. Many operators now have an asset management and obsolescence plan.

For operators that have updated their facilities and assessments during the life of the installation and already have an asset management plan in place, the Life Extension Review will largely confirm that the necessary work has been undertaken and is up to date. Where installations have changed ownership, and/or where operators have adopted a minimalist maintenance approach, the Life Extension Review needs to be more extensive in scope, establishing the current condition and foreseeing changes during future service.

1.3 SCOPE OF THE GUIDELINES

The aim of these guidelines is to provide a consistent agenda to enable senior engineering personnel to justify continued service and life extension of an installation beyond original design or anticipated service, that aligns with good practice in the oil and gas sector. They should assist duty holders to gain regulatory consent to operate where required.

These guidelines are applicable to any region of the world. In jurisdictions such as Norway, regulators require licensees to apply for consent to operate an installation for a specified period beyond the design life or current agreed lifespan. In other jurisdictions, such as the United Kingdom, regulators adopt a process based on five yearly thorough reviews and revision of the safety case, where exceeding design life is considered as a material change. These region specific approaches to life extension and the implications of Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations and amending directive 2004/35/EC (known as the Offshore Safety Directive) are reviewed in Annexes A to C.

These guidelines apply to fixed steel jacket and concrete installations including pipelines. They apply to the entirety of the installation, including the primary structure, topside processing and export facilities, and essential safety and production systems. Subsea equipment is within the scope where failure could cause a hazard or threaten production.

Most of the guidelines will also be relevant for floating installations, particularly the topsides. Classification of mobile floating structures for further service is renewed on a regular basis each time they are brought into dock and inspected. Semi-permanent moored floating installations such as Floating Production and Storage Offloading units (FPSOs) also have the potential to be brought into dock for a thorough inspection during service. Floating installations and associated riser and mooring systems tend to have a shorter life and accelerated ageing due to exposure to dynamic conditions.

The main areas for review are the parts of the installation that are critical to maintaining safety and environmental barriers and production. In practice, these cover the load-bearing structures and foundations, helidecks and bridges, pipelines, the main hydrocarbon containment, and technical safety equipment (active and passive fire protection systems, fire and gas detection and emergency equipment).

In addition to considering equipment, these guidelines also consider the need for updating hazard and risk assessments for the period of life extension. Where applicable, these include the quantitative risk assessment, hazard identification/operability (HAZID/HAZOP) studies, emergency preparedness and response, and the external environment in terms of changes to regulations and codes and standards. Entering a period of life extension is the time to update design assessments, taking account of the latest methods, knowledge, data, experience and learning.