Using a net environmental benefits approach to evaluate decommissioning options for offshore oil and gas platforms

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Decommissioning in the North Sea

An increasing number of the world's offshore oil and gas production platforms are reaching the end of their productive life. Approaches for the decommissioning of decades-old infrastructure need to be developed to best suit local environmental conditions, comply with national and international regulations, and satisfy the concerns of commercial fishermen, shipping and other stakeholders with interests in the offshore environment.

At present, the approach to oil and gas platform decommissioning in the North Sea is guided by the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic. This is known as the OSPAR Convention (so named to reflect the original Oslo and Paris Conventions; "OS" for Oslo and "PAR" for Paris). OSPAR is administered by a Commission representing the 15 governments of the western coasts and catchments of Europe, together with the European Union. The Commission's mandate to protect and conserve the North-East Atlantic Ocean and its resources is guided by an ecosystem approach for integrating management of human activities in the marine environment.

The 1,350 offshore installations operational in the OSPAR maritime area, most are sub-sea steel installations and fixed steel installations, are reaching the end of their useful life. These facilities are managed by OSPAR Contracting Parties with oil and gas industry offshore installations, including Denmark, Germany, Ireland, the Netherlands, Norway, Spain and the United Kingdom.

Since 1998, the leaving wholly or partly in place, of offshore installations that have reached the end of useful life is prohibited within the OSPAR maritime area under OSPAR Decision 98/3, which addresses the Disposal of Disused Offshore Installations. However, a competent authority of the relevant Contracting Party may rely on certain environmental assessments and give permission to leave installations or parts of installations in place. How this assessment process should be undertaken is an important and vexing challenge, at present.

Offshore installations are part of the marine environment

Scientific research has shown that offshore platforms can play an important role in biodiversity and supporting sustainable recreational and commercial fisheries. Offshore structures support marine communities that either naturally occur or have subsequently evolved within the exclusion zones maintained around surface and subsurface infrastructure. Open water and sea floor structures provide habitat for fish that require reef-like structure and similar hard substrate for their lifecycle, and attract many species of migrating invertebrates and fish searching for food, shelter and places to reproduce.

In addition, offshore subsea structures have been shown to provide benefits to marine mammals, threatened and endangered species, and to serve as sanctuaries to protect fish stocks from overfishing. Thus, operating oil and gas fields could be considered, unofficially, as marine protection and conservation areas that limit the ecological pressures imposed by other commercial activities.

Benefits in the North Sea

Research has demonstrated a positive correlation in the US Gulf of Mexico between the presence of infrastructure and commercial fish catch, and encouraged the "rigs - to reefs" program in the US since the mid-1980s. Unlike the US Gulf of Mexico and elsewhere, however, the correlation between the presence of offshore platforms and commercial fish catch is uncertain in the North Sea.

The scientific debate in the North Sea largely centers on changes in fish stock before and after removal of offshore structures. The question debated is whether surface and subsea structures increase the total stock and abundance of commercial species or simply encourage their redistribution due to the reef-like effect afforded by the presence of platforms in open water and on the sea floor.

Though oil and gas platforms have been in the North Sea since the 1960s, evidence of the long-term benefits to marine ecology remains uncertain. More research is needed to understand past, current and projected future fish stocks in the presence and absence of offshore platforms.

Is complete removal affordable?

The UK Oil & Gas Authority estimates the cost of decommissioning to the UK as an OSPAR Contracting Party may be as much as £17 billion during the next 10 years. Costs will likely rise to as much as £47 billion by 2050[1]. Energy market research predicts that by 2040 between US$ 70 and 82 billion will likely be spent on decommissioning activities in Denmark, Germany, Norway and the UK, as the North Sea enters a permanent decline in oil and gas production[2]. The UK will claim approximately 60% of this expenditure, as the country with the most offshore infrastructure.

At present the majority of decommissioned platforms are dismantled while in place at sea and transported back to shore for further dismantling and disposal or recycling of the topside, jacket and supporting infrastructure. An offshore platform's support structure has to be completely removed if it weighs less than 10,000 tonnes; but, if the structure is heavier and was built before 1999 (i.e before removal was considered part of rig designs), the responsible owner or operator may apply for OSPAR 98/3 "derogation", thereby allowing some portion of the rig to remain in place.

Falling prices of oil and gas and corresponding cuts in expenditure are driving investigation into alternate, cheaper approaches to decommissioning that also use the assets as economically as possible. Several viable decommissioning options are available for surface and subsea structures. It is, therefore, important to determine which option(s) provide the greatest net benefit to stakeholders while respecting the safety of shipping lanes, commercial fishing and the environment.

Avoiding decision-making paralysis

The escalating costs of decommissioning and absence of sufficient scientific information on the benefits of in-place management of offshore open water and subsea structures cannot, and should not, deter decision-making with respect to decommissioning in the face of the growing number of offshore facilities that have reached their end of useful life. The current default OSPAR requirement under Decision 9/98 mandating complete removal may not necessarily be in the best interest of the oil and gas sector, national economies, the natural environment or future human use.

Net environmental benefit analysis (NEBA) is emerging as perhaps one of the most useful comparative assessment approaches for weighing the environmental risks, benefits and costs between competing decommissioning options. NEBA aides in identifying the trade-offs inherent among the ecological, social and economic factors in environmental decision-making involving decommissioning plans for offshore structures. NEBA has been applied to a variety of environmental decision-making frameworks including contaminated site remediation, environmental impact assessment, oil spill response preparedness and planning and compensatory restoration.

Linking affordability and optimizing environmental benefits

NEBA is a systematic process for quantifying and comparing the benefits and costs between competing alternatives. NEBA and similar comparative cost-benefit analytical tools in that they consider time accumulated service flows (i.e. benefits and costs over time).

However, NEBA takes decision-making analysis one step further by including consideration of non-monetary environmental metrics similar to resource equivalency type methods. NEBA aims to incorporate information on ecological habitat value (e.g. fisheries habitat and associated stock changes), social value (e.g. recreational opportunities to the public such as diving and sport fishing), and economic value (e.g. enhancement to fish stocks affecting commercial fishing and shipping) associated with competing decommissioning options. Other metrics that are also considered in NEBA include chemical hazards, greenhouse gas emissions (GHGs) and implementation risks such as worker health and safety.

Examining the trade-offs between options

Within the decommissioning process, NEBA can be used to evaluate competing options for the disposition of cuttings piles, jackets, and other subsea structures. For example, jacket decommissioning options such as complete removal, partial removal to various depths, conversion to other uses (e.g. rigs to reefs), or a combination of these can be compared on the basis of the net benefit that each option provides from an ecological, economic and social point of view. NEBA can also provide information to demonstrate that a decision meets as low as reasonably practical (ALARP) requirements and considers the wide-range of potential stakeholder concerns.

As offshore platforms in the North Sea reach their end of life, consideration of decommissioning options should be directed at maximising the ecosystem service values to the public. OSPAR 98/3 derogation cases that retain subsea potions of rigs in order to preserve marine habitats and support commercial fisheries should be considered and compared to traditional full removal requirements. Partially decommissioned rigs and substructure could enhance fishery productivity, improve ecological connectivity, and facilitate conservation/restoration of deep-sea benthos such as cold-water corals and other protected and/or valued marine life. Preliminary evidence indicates that decommissioned rigs can also help rebuild declining fish stocks.

Path forward

Using NEBA to support decommission decision-making provides a win-win solution for the environment, the regulatory community, oil and gas sector and other stakeholders that rely on North Sea marine resources. The methodology offers a transparent, scientifically-based, defendable and quantitative approach for comparing different alternatives. The approach can help stakeholders to identify their concerns and, in turn, help operators and OSPAR Contracting Parties to better evaluate their decommissioning options and risks; identify opportunities to create environmental, social and economic value; and, support decision-making based on a defensible science and engineering analysis of the trade-offs between benefits and cost.

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[1] oilandgasuk.co.uk/wp-content/uploads/2015/09/Dr.-Angela-Seeney-The-Oil-and-Gas-Authority.pdf
[2] http://www.douglas-westwood.com/report/oil-and-gas/north-sea-decommissioning-market-forecast-2016-2040/