The National Decommissioning Centre

Innovation through Partnership

Oil and Gas Decommissioning

Case Studies

The North Sea is a well-established basin in terms of oil and gas decommissioning, however there are still many challenges to address. Cost is an obvious one. Despite the progress made to date, reducing the decommissioning burden on both companies and the treasury remains a major driver. Technology development and adoption provide opportunities but must be augmented through collaboration and changes to tendering and contracting practices. Beyond the financial aspects there are significant environmental questions to be answered. Whilst OSPAR Decision 98/3 drives the removal of most offshore infrastructure, the potential for non-operational structures that are free of contaminants, to provide benefits to marine biodiversity is under debate and requires further scientific evidence. The fate of structures that are left in place is another area for consideration in terms of both safety and the long-term value or detriment to the marine ecosystem.

The decarbonising of decommissioning operations is a growing challenge as we work towards net zero greenhouse gas emissions.

The NDC is working in collaboration with partners, including industry, to address important facets of these challenges. Here we present three case studies that have delivered new insights and methodologies to support decision making and advance current practices in decommissioning.

Photo courtesy of Able UK

Case Study 1

Risk-based marine impact assessment of NORM & Mercury from decommissioning offshore infrastructure

Challenge

The benefits of leaving offshore infrastructures in situ, as a decommissioning option, is of increasing interest to the energy sector and the regulators in several international regions. Of particular focus, are the studies showing the ecological benefits of artificial reef developments. In contrast, a more in-depth understanding of the long-term environmental and food web implications of contaminants (e.g. mercury, NORM) associated with these in situ infrastructures is required.

What we did

Successfully developed a conceptual framework and predictive models to estimate the potential risk from pipeline associated mercury and naturally occurring radioactive material (NORM), in Australian basins. The modelled predictions, shows that for NORM, predicted intensity of the modelled decay change of radioisotopes will increase with time and persists for millennia, whilst mercury is ubiquitous and accumulates in the environment. This project led to the development of a food web model for mercury in marine ecosystems.

Outcomes and benefits

Follow-on work has developed a model for estimating food web wide risks of increased exposure to mercury in the North Sea. This model has been used to assess the potential accumulation of mercury into different marine species under selected decommissioning scenarios and extrapolates the predictions to determine the risks to human health. With the currently available data, no significant risk was determined for selected scenarios.

Case Study 2

A decision framework for the post-decommissioning monitoring of offshore oil and gas assets

Challenge

Within OSPAR Decision 98/3 there is a presumption that all installations will be removed from their present locations on the seabed, and re-used, recycled, or disposed of onshore. However, it recognises that this may not be practical or safe in all circumstances and that derogation may be granted for certain categories. Post decommissioning, the condition of any remains will have to be monitored at appropriate intervals by the owners. At present there are no guidelines for generating a post-decommissioning monitoring plan.

What we did

Shell UK and the NDC initiated a collaborative project to develop a framework for post-decommissioning monitoring of derogated offshore structures. A five-step monitoring strategy is proposed for assessing the structural and environmental risks utilising critical measurands, long-term deterioration models and technologies. It is recommended that the post-decommissioning monitoring should be based on the pre-posterior decision-making strategy.

Outcomes and benefits

This newly developed framework enables effective decision making to arrive at the optimal monitoring strategy for derogated offshore structures, which might have implications for other users of the sea and the potential future installation of new energy systems e.g. renewables, hydrogen production or carbon capture utilisations and storage (CCUS).

Case Study 3

Greenhouse Gas (GHG) Emissions from decommissioning in the marine environment

Challenge

A full evaluation of the GHG emissions associated with decommissioning in the UKCS is lacking. Although estimates of the expected GHG emissions must be included in the pre-activity Environmental Impact Assessment, currently a close-out report of emissions is not routinely prepared as would be standard in, for example, Norway, to allow for a comparison of estimated and actual emissions from decommissioning projects.

What we did

This project quantified the cumulative emissions from decommissioning considering onshore and offshore operations. It also considered other factors that have an impact, for example emissions from transport and the shipping of materials. This study indicated that such sources may have been omitted from existing GHG emission calculations for oil and gas decommissioning.

To response to a lack of available data new top-down models were developed to quantify GHG emissions from decommissioning to better understand the impact on the atmosphere and marine environment.

Outcomes and benefits

This study recommends that new guidelines are needed to allow for accurate pre-decommissioning GHG emissions figures to be calculated. New legislation is also required to ensure a close out report includes GHG emissions data. Furthermore, new methods for both calculating emissions and undertaking the decommissioning operations are advised in the papers published as a part of this research.