

Environmental impact

Does a bottlenose dolphin change its ranging movement because of a wind turbine? Or a razorbill change its migration route? How do human beings change behaviours with an offshore wind farm nearby? PES brings you a pioneering scientific research programme from Vattenfall, which aims to answer these questions and more.





Photo: SMRU dophin pod by Monica Arso

Four projects have initially been selected to receive a share of the €3mn Scientific Research and Monitoring Fund which is the brainchild of Swedish energy company Vattenfall. The projects will be based at Vattenfall's European Offshore Wind Deployment Centre (EOWDC) in Aberdeen Bay.

Adam Ezzamel, Project Director for the EOWDC, said they felt such a programme represented an opportunity that was too good to miss. 'These projects will be carried out in a real-time environment as part of the largest-scale offshore wind programme of its kind. Conducting this research at the EOWDC is an unmissable chance to gain hitherto unknown knowledge of the environmental effects of offshore wind developments.'

'Not only will this programme place Scotland at the forefront of research and development in the sector and reinforce its position as a renewable energy powerhouse, it will inform industry policy-making in Europe and beyond.'

The 11-turbine EOWDC is Scotland's largest offshore wind test and demonstration facility, and construction of the cutting-edge facility began in October 2016.



Adam Ezzamel, Vattenfall

The first of these projects will examine bottlenose dolphins along Scotland's east coast. The Sea Mammal Research Unit at the University of St. Andrews has teamed up with SMRU Consulting to improve the understanding of the dolphins ranging patterns.

The species has been studied in Scotland

since 1989 by identifying individual dolphins from scratches and nicks on their dorsal fins and this led to the Moray Firth being designated a Special Area of Conservation in the 1990s. Since then, it's become clear that the population has expanded south as far as the Tay Estuary, St. Andrews Bay and the Firth of Forth.



Philip Hammond, Professor of Marine Ecology at the University of St Andrews, will lead the project, which will intensify sampling in the Tay Estuary and adjacent areas for the next three years. 'The bottlenose dolphin is an important predator in Scottish coastal waters and by increasing sampling across the entire season we will gain valuable insights into the extent and patterns of movement between the northern and southern parts of their range, which remain poorly understood.

'We'll collaborate with researchers in the Moray Firth and combine our findings with existing data. When combined, we will have a greater knowledge of not only about the rates of movement, but also the population size, mortality and birth rates.

'Long-term studies such as this are key to understanding how human activities, such as at-sea energy developments, can affect behaviour and the dynamics of the population. The results will inform offshore wind developments and allow for a focus on mitigating any potential impact on dolphins.'



The River Dee Trust and Marine Scotland Science (MSS) have devised a project to study different sea creatures. Their project aims to determine the migration routes of salmon and sea trout relative to the physical marine environment. To do this they will track the movement of these fish through the rivers Dee, Don and Ythan as all three are located within 10km of the EOWDC.

This year acoustic tags will be fitted to 300 juvenile salmon and 100 sea trout as they exit the rivers and navigate up the North-East coast. Next year, 91 receivers will be deployed in the estuarine and near-shore environments to determine the direction of travel and these will be redeployed in subsequent years to refine pathways and create a picture of dispersal zones when the fish exit rivers.



Mark Bilby, who is River Director for the River Dee Trust, says the project will help fill a gaping knowledge gap. 'Some salmon and sea trout will venture as far the west coast of Greenland when they exit these rivers and at the moment we actually know more about their movements in the open ocean than we do in coastal waters. It is pivotal that we understand more about the routes these fish take, particularly when more offshore wind farms will likely be developed in coastal areas.

'The information we will collect on this project will be fed into the Scottish Shelf Model, which is the existing hydrodynamic model developed by MSS. However, the data should prove valuable to developments not just in Scotland but further afield too as it will inform where fish may be encountered, the scale of such interactions and whether these fish follow narrow pathways or wider routes to sea.'

Mark Bilby, River Dee Trust



It is not just underwater creatures that are impacted by offshore wind. Glasgow-based MacArthur Green will use a different kind of tag to collect information on guillemots and razorbills. Both are considered potentially vulnerable to displacement by offshore wind developments.

This project will see small geolocator tags fitted to a number of these species of seabirds to collect data on the year-round movements of both and how such movements are affected by offshore wind farms.

MacArthur Green's Principal Ornithologist, Professor Bob Furness, says the geolocator tags will allow for much more refined position estimates on both species. 'The tags have a battery life of up to five years and can be fitted to a leg ring. What's important is that they record both light intensity and sea surface temperature (SST) on a time base memory chip. SST can vary considerably in different locations, so the combination of both will allow for greater accuracy in estimating positions.

'It's challenging to track seabirds for a prolonged period of time so we don't have a lot of information on their movements during the non-breeding season but this project should address this. Until now our knowledge of their migrations has largely been based on the recovery of ringed birds found dead on beaches in winter, which doesn't necessarily paint an accurate picture. Now, we hope to uncover the routes used by birds, where they spend time during winter and if they nest in

different areas or return to favoured locations year after year.

'All the data from the tags will be analysed and it should inform any displacement concerns in relation to offshore wind farms and ultimately, this allows for less uncertainty in future planning applications and improved understanding of how to best conserve these internationally important seabirds which are an iconic part of Scotland's natural heritage.'

Last but not least, let's not forget about the human factor. People can also find their ways of life impacted by nearby offshore wind developments. The economic and societal benefits of renewable developments, such as job creation, inward investment and mitigating climate change, have been well-documented as the North-East of Scotland diversifies from oil and gas. But the actual advantages have never been studied in detail.

Oxford Brookes University will carry out an assessment of the socio-economic impact of offshore wind farms on the human environment. Dr. Bridget Durning says this will be the most in-depth study of its kind to date. 'Research like this has never been carried out in detail before, and we will combine our established work on evaluating the socio-economic impacts of major energy infrastructure with recent work on the cumulative effect of offshore wind farms to investigate the impacts.

'We'll explore the methods used to predict the likely impact of developments before planning permission is given and, as the

EOWDC is being built, gather data on the impacts during the construction and initial operational phase of offshore wind farms. As well as the EOWDC, we will examine two other developments in the UK to determine influential factors and where impacts vary and align. An overview of practices in other countries such as the Netherlands and Denmark will be conducted to see if the UK can take any learning points from them.

'At the end of the project we will have unparalleled information on the real, tangible socio-economic impacts of developments and identified best practice methods in not only understanding these impacts, but maximising the beneficial aspects at a local level.'

Almost 100 applicants applied for the programme, before being whittled down to shortlist of 16 then a final four by the panel of experts.

The programme was devised by Vattenfall but a panel comprised of the brightest and best environmental experts in Scotland and the UK advised on the winning projects. Representatives from Vattenfall, Aberdeen Renewable Energy Group, Scottish Natural Heritage, Marine Scotland Science, the Scottish Environment Protection Agency, RSPB Scotland, the Joint Nature Conservation Committee, Whale and Dolphin Conservation and the Crown Estate.

corporate.vattenfall.co.uk/projects/wind-energy-projects/european-offshore-wind-deployment-centre/