Summary

Offshore wind farm operators undertake a regular review of emergency response arrangements, taking on board learning from risk identification workshops, drills, and significant near-misses.

To supplement its existing basic first aid training, provided through the Global Wind Organisation/RenewableUK standard, one offshore wind operator (who preferred not to be identified) implemented advanced medical training for many of its offshore technicians and support staff.

This advanced training was put into practice during an incident whereby a worker was injured in a turbine hub. Evaluation of the treatment provided, and the emergency response undertaken, highlighted that the advanced training was a significant factor in getting the injured party successfully transferred to hospital, and was material in ensuring his injuries did not become life-threatening.

In light of this real-life incident, others in the industry are being encouraged to consider their arrangements, and to drive further adoption and standardisation.

Lessons Learned

- The offshore wind operator featured in this O&M Case Study, in partnership with the turbine maintenance provider, provided additional advanced medical training to offshore workers. This URIECA (UK Remote Immediate Emergency Care Advanced) training was developed by Humberside Fire and Rescue Solutions Community Interest Company, in association with Trauma & Resuscitation Services Ltd.
- An offshore worker was injured while undertaking a routine cleaning task which resulted in potentially life-threatening injuries. Advanced training enabled first aiders to identify the potential for life-threatening conditions to develop, deliver medical care to stabilise the casualty, and ensure that movement of the casualty was undertaken safely.
- Without the recently-upgraded specialist medical equipment and advanced medical training, the outcome for the injured party could have been significantly worse and potentially life-threatening.
Introduction

Offshore wind farms offer unique challenges in the event of a worker’s illness or injury. Far from shore and with limited on-site facilities, owners must put in place appropriate emergency response plans.

Operators plan for scenarios including illness and injury, either of which could occur in restricted work areas and potentially at heights of around 100m. While support is available from UK Search and Rescue, this is generally limited to winching a casualty from a turbine or vessel. It therefore falls to owners to ensure that appropriate support is available to provide initial diagnosis and care at the scene, as well as preparing the casualty for lowering to a waiting vessel and/or lifting into a helicopter.

The operator of the wind farm introduced on page one had undertaken a project to review and improve emergency response arrangements at a number of wind farms under its control. This included consideration of the approach to incident management, first aid skills and rescue equipment.

The wind farm in question is operated from a dedicated O&M base and is accessed by crew transfer vessel, with a journey time of around one-and-a-half hours.

Within the dedicated O&M base there is a local control room which operates the wind farm and provides marine coordination. One of the functions of the control room is to provide support as part of the emergency response plan. This includes coordinating with external support agencies and ensuring effective communication between off-site teams, vessels, and onshore support staff.

Developing an Improved Approach to Emergency Response

As part of its emergency response arrangements, the wind farm’s operator undertook a review of the effectiveness of its plans and approaches in 2015. One of the key findings from this review was that medical assistance offshore could be improved. The operator had adopted standards developed on an industry-wide basis which provided basic first aid training – the underlying premise was to provide an initial response which would then be supported by professional medical experts. The operator’s assessment highlighted a need for additional medical capabilities.

The operator worked closely with all of its maintenance contractors as it reviewed potential improvements to its emergency response arrangements. This joint approach was key to understanding the potential emergency scenarios and assessing existing arrangements. The site teams took a joint decision to provide additional medical training at a more advanced level. This would increase their capability to diagnose injuries, allow them to provide initial life-saving treatment, and enable the stabilisation of a casualty prior to them being moved to an area where they could receive professional medical support.
As part of this project, advanced medical treatment kits were purchased and deployed onto the vessels operating in the wind farm, and other items of rescue equipment (e.g. stretchers used to lower casualties from height) were upgraded by the operator. Advanced first aid kits, like the one shown in Figure 1, were supplied in easy-to-handle bags. Most items in the kit have an eight-year shelf life.

![Advanced medical kit](image)

**Figure 1: An advanced medical kit used at the site following improvements to the emergency response arrangements.**

The site team worked with Humberside Fire and Rescue Service, which has developed a specialised service to support offshore wind farms. They jointly developed an advanced medical training course, which was delivered to small groups of technicians with support from Trauma Resuscitation Services Limited. Initial training is followed by the delivery of a “maintenance of skills” package, which provides regular refresher training and practice drills. All of the technicians who have undertaken training are taken from a pool of volunteers. Thanks to the proactive approach adopted, the overall improvement project has seen significant buy-in from everyone involved.

“In the space of 10 minutes, I’ve just been shown how to do something that could save someone’s life.”

An offshore wind technician during a recent URIECA training session.

The improvements made were:

- Provision of additional advanced medical response training to supplement Global Wind Organisation first aid training.
- Provision of advanced medical kits on vessel.
- Provision of advanced medical grab bag, containing immediate life-saving equipment, to working teams.
- Deployment of Chrysalis rescue stretchers in each nacelle and onboard vessels.
- Introduction of Jag pulley systems to supplement original turbine systems.
Application of the Improved Approaches During an Incident

As part of the emergency response plan at the site, the local control room includes marine coordinators who assist in coordinating the management of an incident. Around one third of technicians are trained in advanced techniques and are available to support in the event of an incident on the wind farm. In this case, both an advanced rescue team and an advanced first aid (AFA) team were dispatched to support the incident response. Stretcher are available, both on the turbine and vessel, as were the aforementioned advanced medical kits and equipment.

Responding to a Real-Life Emergency

In June 2017, during routine maintenance work in one of the turbines at the offshore wind farm in question, a technician was preparing to clean up an oil spill in the turbine hub. This is a routine task and on the day in question there were no abnormal circumstances. While undertaking the cleanup the technician slipped on the oil, falling backwards and impacting their back on a pitch ram. Figure 2 shows the scene of the incident, with the pitch ram adjacent to the steel chequer plate work platform.

Once the incident had been reported, an advanced rescue and an advanced first aid team were called to the scene to assist. The injured person was able to climb down the turbine under close supervision from his team leader, but was not well enough to climb to the vessel. When the advanced first aid team arrived on scene, they found the injured person slumped over a box and in considerable pain. The first aid team assessed the injury and found significant swelling on the right-hand side of the injured person’s upper back. The first aid team administered pain relief to the injured person to allow their safe and comfortable transfer to a Chrysalis stretcher.

Figure 2: The scene of the incident.
On the journey back to the O&M port, the first aid team administered oxygen therapy and conducted a number of support phone calls with the onshore first aid team. On return to shore, the team handed the casualty over to Coast Guard paramedics using the patient report form. The casualty was evacuated to an ambulance after 3 hours and 25 minutes, which then took approximately another 15 minutes to reach a hospital which could deliver definitive care.

Further investigations were carried out in the hospital, which revealed that the injured person had suffered two fractured ribs and bruising to his lungs. The casualty was kept in hospital for four days to manage his pain and for observation. He was signed off for six weeks to recover from the injury.

"Without the advanced medical training and our new equipment, it’s not clear how we could have safely and comfortably transferred the casualty to the vessel."

A member of the project team.

**Post-Incident Review**

The wind farm operator and turbine maintenance contractor undertook a joint post-incident review. This incident demonstrated the importance of the model deployed at the wind farm. The improved rescue and medical equipment, drugs, and medical capability of the technicians all played an important role in the safe evacuation of the casualty. The table overleaf shows an evaluation of the incident outcome without the improvements that have been implemented – an assessment based on the opinions of medical, safety and rescue professionals. It also shows the best and worst case scenarios without the improvements.
<table>
<thead>
<tr>
<th>Rescue Capability/Outcome</th>
<th>How it Happened</th>
<th>Best-Case Scenario Without URIECA and Rescue Improvements</th>
<th>Worst-Case Scenario Without URIECA and Rescue Improvements</th>
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<tbody>
<tr>
<td></td>
<td>The marine co-ordinator scrambled an advanced first aider and an advanced rescuer to the scene. They had the capability to use the Chrysalis stretcher transferred from the vessel. This piece of equipment has an integral harness that protected the casualty while being evacuated.</td>
<td>The marine co-ordinator scrambles an advanced rescuer to the scene. They cannot strap the casualty into the spine board arrangement due to the pain of the injury. The Coast Guard is informed and they attend but are not able to climb the turbine. As the injured party's condition deteriorates, the Coast Guard takes the decision to break their policies and climbs the turbine to rescue the injured person from the davit in a rescue stretcher after giving pain relief.</td>
<td>The marine co-ordinator scrambles an advanced rescuer to the scene. The only spine board arrangement available is supplied by the vessel, leaving the injured party in significant pain. The team attempts to lift the injured party on the davit crane as the injured party is in too much pain to move. The Coast Guard is not available to attend the incident. The casualty eventually passes out and is transferred to the vessel.</td>
</tr>
<tr>
<td>Medical Capability/Outcome</td>
<td>The seriousness of the injury was understood when the advanced first aider examined the casualty. The early understanding of the injury and treatment received allowed rapid extraction and comfort for the injured party. Outcome: the injured party was found to have two broken ribs and bruised lungs, requiring four days hospitalisation.</td>
<td>The injury is not understood by the first aider and so no treatment is available. The delay in care leads to unnecessary pain and discomfort for the injured party. Other serious underlying conditions related to the injury could go undetected. There is a heavy reliance on the emergency service to break their policies to treat and extract the casualty.</td>
<td>Forcing the casualty into the stretcher arrangement leads to excessive and unnecessary stress being placed on the injury. This leads to the lungs bleeding internally or a piercing of the lung tissue by loose bone, causing either a tension pneumothorax or massive haemothorax, which if untreated could potentially result in death.</td>
</tr>
</tbody>
</table>

Table 1: Contribution of advanced medical training to injured party's outcomes.
Lessons Learned

The incident described was caused by a slip on oil during a routine cleaning task. While efforts are made to tackle the causes of oil and hydraulic fluid leaks, this is a commonplace activity. It is clear from the medical opinions received during the post-incident review that the availability of advanced medical competence and equipment had a very positive effect on the outcome. In particular, the review noted the following lessons:

- Advanced medical training allowed for a much better assessment of the injuries suffered and a better awareness of the potential consequences of these injuries in relation to the evacuation plan.
- Availability of pain control was a significant factor in enabling a fast evacuation to the vessel.
- The site team has raised the awareness of hazards from cleaning to ensure it is seen as a task in its own right.
- Cleaning was previously included as the final task on the work order but is now carried out first to lower the residual risk.
- The site team is looking into the provision of improved non-slip properties on parts of the turbine.
- The incident reinforced the advantages of existing training drills and maintenance of skills.
- Using specialist providers to deliver training has enhanced the transfer of skills and improved confidence levels.
- Consideration should be given to the effects of injuries when moving casualties around the turbine and between the turbine and vessel.
- Pain control was highly successful in ensuring a positive response to the incident.
- Effective communication and co-ordination between shore-based teams and the offshore response team is vitally important.

Key Success Factors

In improving the medical response to an offshore wind farm emergency, it is important to:

- Raise awareness of the benefits of advanced medical skills and seek buy in. In this case, the operator encouraged workers to volunteer to improve their skills.
- Work with key subcontractors (e.g. the turbine maintenance provider) to encourage a common approach and increase the pool of workers with advanced medical skills.
- Identify equipment that is robustly packaged and has a long shelf-life to offer good value for money and simplify procedures for managing supplies.
- Provide advanced first aiders with an on-turbine medical kit and supplement this with a comprehensive medical kit on each vessel.
- Identify stretchers that provide an effective means of escape without worsening injuries.
- Factor in time for skills refreshers and top-up training on a regular basis to prevent skill fade.
- Work with specialist training providers using small group training techniques and hands-on skills teaching.
Advanced Medical Training in Detail

The UK Remote Immediate Emergency Care Advanced (URIECA) course is designed specifically for those working in the most remote environments, where a patient with life-threatening injuries may be a long way from an ambulance response. The aim is to reduce preventable pre-hospital deaths by training attendees to identify and treat life-threatening emergencies and prepare casualties for rapid evacuation to hospital.

Training takes place in a practical environment over three days. The syllabus includes:

**Kinematics**
How to perform a SCENE (Seal area, Control, Emergency services, Notify, Evacuate) approach and predict injury based on the evidence of forces and motion as derived from the accident scene.

**Catastrophic Bleeding**
Learn to identify both internal and external haemorrhaging and apply suitable treatment such as tourniquets and haemostatic agents.

**Airways**
Develop skills in identifying and managing airway problems, including use of OP/NP and I-GEL airways.

**Breathing**
Study serious chest injuries and their management, including the use of chest seals.

**Circulation**
Examine how the circulatory system works and how to identify and treat shock.

**Disability**
Identify and treat head injuries and prevent secondary brain injury.

**Extremity Trauma**
Identify and treat fractures and soft tissue injury using a wide range of splints and slings.

**Burns**
Understand the different types, severity, and treatment of burns.

**Suspension and Crush Injuries**
Recognition of the severity of suspension trauma, crush injuries and management of these conditions.

**Packaging and Evacuation**
Learn the different ways of packaging casualties for rapid evacuation and choose appropriate extrication and transport equipment for time-critical patients including long boards, vacuum mattresses, scoop stretchers and speed boards.

**Special Circumstances**
Discuss adaptations of treatment for victims of drowning or poisoning.

**Triage**
Understand major incident issues, prioritisation and management of multiple casualties.

**CPR and AEDs**
Learn the Resus Council 2015 CPR guidelines and the safest and most effective way to use AEDs.

**Medical Gasses**
Understand the physiology of respiration and the indications and contradictions for oxygen and entonox therapy.
Appendices

Further Reading


Author profiles

**Dr Conaill Soraghan** is Team Leader for O&M Data Systems at ORE Catapult. He has a background in applied mathematics and completed a PhD in wind turbine design. Conaill's main area of interest is the management and optimisation of operational assets and he has extensive experience in the design and development of benchmarking systems and data/knowledge sharing for the offshore wind industry.

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About the O&M Case Studies series

This is one in a series of offshore wind O&M-focused case studies, supported by ORE Catapult’s O&M DFm and funded by The Crown Estate and the Offshore Wind Programme Board. These studies aim to highlight game-changing O&M projects, and promote the dissemination of knowledge among the offshore wind O&M community.

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