

Lifts in Wind Turbines

Health and Safety

February 2011

Document Version:

Issue 1 - February 2011

Status/Changes:

Original Document

Status of this document

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Introduction

RenewableUK recognises its responsibility to take a lead on Health & Safety matters as they relate to the risks particular to the renewable energy sector.

We reaffirm our commitment to ensure that Health & Safety remains the top priority in the wind, wave and tidal industry, and that best practice should be applied to ensure the good reputation of renewable energy generation. RenewableUK is committed to promoting best practice and developing and communicating Health & Safety knowledge and experiences as they develop.

This Health & Safety briefing sets out a basic summary of the current state of knowledge regarding the selection, installation and commissioning of lifts¹ for use within large wind turbines,² and how this relates to compliance with the Machinery Directive 2006/42/EC³ for devices supplied to UK wind farms and arrays after 29 December 2009. It does not aim to address the additional duties that apply to the operation and use of lifts post-commissioning, although this is a vital part of the wider safety management of lifts.

In addition to the general information set out below it should be understood that duty holders including designers, developers, operators and owners must still perform project, site, turbine and access specific risk assessments⁴ to determine the most effective approach to managing lifts specifically and working at height more generally.

This briefing sets out:

- A background to the issues and their relevance to the wind industry (“the industry”);
- Legal opinion on principal issues concerned with respect to addressing compliance with the Machinery Directive 2006/42/EC with respect to lifts;
- A commentary by RenewableUK on the issues concerned; and
- Good practice advice about managing access/lift safety.

1 For the purpose of this document lifts are considered as any machinery or device used to move goods and/or persons, involving a change of level by means of a carrier.

2 For the purpose of this document large wind turbines are any generators with a swept rota area >200m² and where primary access to the nacelle is internal to the tower.

3 Requirements implemented via the Supply of Machinery (Safety) Regulations 2008. See Appendix.

4 This briefing has assumed that suitable risk assessments have been performed that conclude that lifts are the most suitable method for achieving safe access in the wind turbine.

Background

Principal risks

Any activity involving working at height must be considered a potentially serious safety risk. The principal risks involved with working at height in a wind turbine will arise out of the direct risks including falls from height and falling objects.

However, a number of consequential risks can arise where working at height and associated operational tasks have not been adequately managed. These could include electrical and mechanical hazards, task-based environmental hazards (e.g. slips and trips), risks from restricted locations and the potential to compromise effective emergency response associated with working at height. The failure to adequately manage these could lead to death or serious injury.

Use of lifts

Until relatively recently lifts have not been the default method of access technology used in the industry. However, the impact of recent Health & Safety legislation combined with developing industry expectations about how to best manage working at height have necessitated duty holders to consciously consider the practicalities of lift installation.

The key legislation applicable to this topic is the Work at Height Regulations 2005 (“WAHR”) and the Machinery Directive 2006/42/EC.⁵ Together they set out specific duties concerning safe access relevant to the supply and installation of lifts in turbines. In addition, the industry in recent years has taken a proactive lead in recognising that, with the growing size of turbines and the increasing number of turbines installed in the UK, there is developing evidence of the potentially wider operational and safety benefits of installing lifts.⁶

However, although there has been a progression towards lifts becoming a more standard means of access technology, this has also led to increased knowledge and understanding of the risks and benefits of installing lifts. This has necessitated duty holders taking a pragmatic case-by-case approach reflecting current product development to ensure the safest and most practicable means of access. Whilst RenewableUK accepts that lifts can address many of the Health & Safety issues involved, their installation could also lead to other risks and in particular electrical, fire and emergency rescue safety being compromised.⁷

The importance of understanding all of the risks, both direct and consequential, when planning safe access in turbines is therefore vital.

⁵ See Appendix for further details.

⁶ Some context and examples are included in Safe Wind Turbine Tower Access: A Decision Making Framework – A Report from TUV NEL and Risktec for BWEA, Issue 2: December 2007.

⁷ These are indicative examples only; others could be foreseeable.

Legal Issues

Legislation

This briefing is not intended to provide a definitive review of Health & Safety legislation relevant to the supply and installation of lifts operated in the UK.

However, those likely to be directly applicable include the:

- Health & Safety at Work etc. Act 1974;
- Supply of Machinery (Safety) Regulations 2008;⁸
- Construction (Design and Management) Regulations 2007; and
- Work at Height Regulations 2005 as amended.

In addition, attention is drawn to the following regulations that duty holders should consider as part of the wider management of Health & Safety risks associated with lifts specifically and working at height more generally. These include the:

- Management of Health & Safety at Work Regulations 1999;
- Provision and Use of Work Equipment Regulations 1998 (PUWER); and
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER).

It should also be noted that the Health & Safety at Work etc. Act 1974 (Application outside Great Britain) (Variation) Order 2009 has now extended the prescribed provisions of the HSW Act to work activities beyond the territorial sea and to other specified areas designated by order under section 1(7) of the Continental Shelf Act 1964. It extends the HSW Act to work activities such as the construction, repair and operation of energy structures and related structures within a renewable energy zone (REZ).⁹

The legislation listed above is far from exhaustive. Duty holders will also need to review the significance and application of other legislation that may be relevant to the selection, installation, commissioning and use of lifts.

⁸ See Appendix for relevance.

⁹ Note: A 2011 Variation Order is being proposed by HSE. See www.hse.gov.uk.

Standards

At present there are no recognised standards (e.g. BS/EN/IEC) against which lifts supplied and used in wind turbines can be fully assessed or approved. It is unlikely that this gap will be addressed by standards bodies in the short term. However, RenewableUK is aware that developments are taking place with Notified Bodies¹⁰ in agreeing *Recommendations for Use*.¹¹ It is hoped this can enable lifts used in turbines to be approved to a recognised and recommended standard on an interim basis until a harmonised standard is agreed. In addition, EN 50308:2004¹² is currently being updated, and the scope of this will encompass access within turbines and lift safety.

Legal opinion

In light of the background to this briefing, RenewableUK took legal advice on the issues. This advice is set out in the Appendix.

¹⁰ Designated by member states as competent to make judgements about the essential requirements of the applicable directive (i.e. the Machinery Directive).

¹¹ These reflect the common position of the Notified Bodies in the machinery sector, which has been endorsed by the Machinery Working Group. They assist Notified Bodies in their tasks of conformity assessment of machinery, mainly for the EC type-examination procedure, in accordance with the terms of the Machinery Directive.

¹² Wind turbines – Protective measures – Requirements for design, operation and maintenance.

RenewableUK Commentary

RenewableUK acknowledges that although lifts will probably be the principal means of access for the majority of large newly built wind turbines, they should not be assumed to be the only option available.

The variable configuration of turbine designs and the interfaces with site and operational factors are such that all access options should be considered, and these decisions should be risk-based according to the:

- Current state of knowledge (legal/technical) concerning lifts and other access technologies;
- Particular risks/benefits of a selected option, taking account both the direct safety risks of the lift and the interfaces concerned, and also consideration of the wider collective and foreseeable consequential risks; and
- Relevant timeline of the life cycle of the project (e.g. new build/retrofit/repowering), which may influence the risk/benefit calculations of a chosen access option, including lifts.

In view of the dynamic state of the industry it is probable that the state of knowledge and best practice will evolve rapidly in the coming years. It is therefore essential that duty holders keep abreast of developments in this field when taking decisions about the selection and use of lifts.

Good Practice

The following good practice is primarily aimed at UK-based clients and developers. It is not intended to provide advice for turbine manufacturers or lift suppliers.

Although the approach below suggests that the Construction Design and Management Regulations 2007 (“CDM”) can provide a useful framework to manage and coordinate the relevant decisions required to ensure compliance regarding the installation of lifts, its practical scope is to a degree limited. The primary responsibility resides with the manufacturers and suppliers as set out in the Appendix. The extent of responsibility on the employer under PUWER Regulation 10 is to ensure that the turbine/lift installations meet the Essential Health & Safety Requirements of the Machinery Directive, but they can discharge this duty by ensuring that the combined wind turbine and lift are CE-marked, have the relevant Declaration of Conformity and are free from patent defects.¹³

In most situations the decision to install lifts will be taken as an integral part of the design and iterative risk assessments performed for the project concerned and the risk assessments carried out by the wind turbine manufacturer as required by the Machinery Directive. The principal duty holders responsible for determining the safety and suitability of lifts are set out in the Appendix but in every case the designer will play a critical role in determining and specifying the safety requirements for lifts. Because of the variety of routes to market, all parties concerned with the design and specification of lifts should fully cooperate and communicate with each other. This should include clarification of their particular roles and responsibilities for the project concerned.

Where projects are carried out under CDM, a prudent client and CDM-C (as defined under CDM) are recommended to consider:

- Having a suitable procurement policy setting out the relevant design, technical and operational safety requirements for the project, covering lift installation;
- Early communication and co-operation with original equipment manufacturers (“OEMs”) and lift manufacturers to allow the opportunity to consider relevant safety issues; and
- Agreeing the selection criteria for the wind turbine/lift combination and associated equipment it interfaces with, taking account of design features, applicable standards and statutory requirements.

¹³ Although this reflects the technically correct position, industry experience has shown that in the UK regulatory environment duties that are owed under PUWER the HSE may present a narrower interpretation of this position. It is important to note that although CDM is an extremely useful tool it cannot solve all problems in this area. If in any doubt you should take professional advice in understanding your obligations in this area.

Clients, owners and operators are also reminded that the installation and use of lifts in a wind turbine should be addressed as an integral part of the wider safety management systems concerned. This would normally include the provision of:

- suitable policies and procedures to address lift safety and working at height risks;
- information for and instruction, training and supervision of employees, contractors and others at risk;
- a regular programme of maintenance and examination, and, where necessary, testing of the lift and associated devices by suitably competent persons; and
- regular audits and reviews to ensure the continued safety and integrity of lifts and working at height.

Reference Sources and Links

There are numerous reference sources available which could be relevant to lift safety specifically and working at height more generally.

The following contacts and links, although not exhaustive, are likely to provide the most relevant and up-to-date information and guidance on the topics set out in this briefing:

- British Standards Institute (BSI) www.bsi-global.com
- Health and Safety Executive (HSE) www.hse.gov.uk
- European Committee for Standardization (CEN) www.cen.eu/cenorm/homepage.htm
- European Community (EC) Directives www.eur-lex.europa.eu/en/index.htm
- RenewableUK www.renewable-uk.com
- Office of Public Sector Information (OPSI) www.opsi.gov.uk
- Department for Business Innovation and Skills (BERR) www.berr.gov.uk

Appendix

Hammonds LLP has been instructed by RenewableUK to provide advice on the context, scope and applicability of the introduction of the Machinery Directive 2006/42/EC on the wind turbine industry.

The advice will look at the various sectors within the industry, e.g. suppliers, manufacturers, operators, and what duties are owed by them.

The advice provided by Hammonds LLP is general in nature and not tailored to one specific organisation. Companies should seek independent legal advice on the applicability of the regulations on their operation.

1 Background of Applicable Legislation

The relevant legislation in relation to this matter is the Machinery Directive 2006/42/EC (“the Directive”), which came into force on 29 December 2009. The Directive has been enacted in the UK by the Supply of Machinery (Safety) Regulations SI 2008/1597.

2 The Directive

The Directive, Machinery Directive 2006/42/EC, provides the regulatory basis for the harmonisation of the essential Health & Safety requirements for machinery at European Union level. To provide a context, machinery can be described as:

an assembly, fitted with or intended to be fitted with a device system either than directly applied human or animal effort, consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application.

For ease of reference, this advice has divided the main parties that will be affected by the Directive into four groups.

2.1 Group One – Manufacturers of complete machines

In relation to those organisations involved in the manufacturer of complete machines, the Directive will present a number of changes from the previous system. A CE officer (CE stands for Conformité Européenne or European Conformity) within the company must be appointed to act as the responsible person to deal with requests for technical documentation from the supervisory authorities, such as the Health & Safety Executive and Trading Standards in the UK. Requests must be dealt with rapidly where they are reasonably made.

(a) Careful Documentation

Where accidents, complaints or other events arise, one of the first demands on the company will be to produce the relevant technical documentation. Companies that can only provide incomplete or alternatively no documentation will arouse doubts with the regulator as to their legal conformity.

(b) Foreseeable Misuse

The principal of foreseeable misuse is a long-established concept and has been highlighted within the Directive as follows:

Machinery must be designed and constructed so that it is fit for its function and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof.

Foreseeable misuse is a well-established concept within product liability matters. From the viewpoint of the manufacturer it is often very difficult to establish what misuse the user might engage in.

It is worth noting that the machinery manufacturer cannot be expected to take account of all possible misuse

of the machinery. However, certain kinds of misuse, whether intentional or unintentional, are predictable on the basis of experience of past use of the same type of machinery or of similar machinery, accident investigations and knowledge about human behaviour. Standard EN ISO 12100-1 provides the following examples of the kinds of misuse or predictable human behaviour that may have to be taken into account:

- Loss of control of the machine by the operator;
- Reflex behaviour of a person in case of malfunction, incident or failure during the use of the machine;
- Behaviour resulting from lack of concentration or carelessness;
- Behaviour resulting from taking the line of least resistance in carrying out a task; and
- Behaviour resulting from pressures to keep machinery running in all circumstances.

The behaviour identified above can result in a range of misuse situations.

(c) Original User Instruction Document

It is essential that there is only one Original User Instruction Document. If such a document does not exist, for example, due to the fact that the product was imported from outside Europe, the importer must ensure a translation of the entire original instructions into the language(s) of the country of use is provided.

(d) Intensive Market Surveillance

The Directive increases the need for continued market surveillance. The most appropriate way of illustrating this is that the freedom of movement of machinery is guaranteed with the “passport of the CE mark”. As the majority of machinery is placed on the market without independent certification by Notified Bodies, surveillance is essential to the fair and effective operation of the single

market for the supply of machinery.

The framework for market surveillance is stated in Article 4, which specifically deals with matters such as:

- Member states taking measures against non-compliant products;
- There being a known national competent authority; and
- Tasks and powers of such an authority being clearly defined and transparent.

On the basis that this concept is applied correctly, a fair market place with high standards of safety should be ensured. It is essential that authorities in each member state consider that machines may be unsafe when used for their intended purpose and also “under conditions which can reasonably be foreseen”.

2.2 Group One – Implications for the wind turbine industry

The situation outlined above in relation to Group One (manufacturers of complete machines) is applicable to a situations in which a wind turbine is manufactured by one manufacturer and the lift was incorporated into the original manufacture process.

It would be essential for the manufacturer of the “complete unit” to ensure that they complied with the regulations as set out above under the Directive. A company would be required to have a CE officer to ensure that the technical documentation for the turbine, as well as for the lift, was correct.

The Directive raises the possibility of foreseeable misuse (please refer to 2.1 (b) above). It is essential that the manufacturers of complete wind turbine units ensure that they take into consideration the possible misuse of lift equipment that is fitted within them

when identifying potential hazards and conducting the appropriate risk assessments.

2.3 Group Two – Manufacturers of partially completed machinery

Under the Directive the obligations of the manufacturers of partially completed machinery are considerably expanded from the point of view of design, instruction and documentation.

(a) The Declaration of Incorporation

Under the Directive a manufacturer’s declaration will no longer be required; however, a Declaration of Incorporation, the content of which is comprehensive, will be needed. The Declaration of Incorporation must state what safety requirements of the Directive have been applied and complied with. In addition, it must be stated whether other EC Directives have been complied with. It should be noted that manufacturers of partially completed machinery must undertake, in the Declaration of Incorporation, to provide the authorities of EU member states, on request, with certain documents such as technical drawings, wiring diagrams, operation manuals, assembly guides etc.

(b) Documentation – New Form

The Directive provides for a new form of documentation in the case of partially completed machinery. The documents must state clearly what requirements of the Directive apply to the relevant partially completed machinery and whether they have been complied with. It is essential that the technical file contain the following to ensure compliance:

- A general description of the machinery;
- The overall drawing of the machinery, drawings of the control circuits and;
- Documentation on risk assessments.

Further, Annex VII B of the Directive

contains regulations for the testing of components and fittings to determine whether by their design or construction they are capable of being assembled and put into service safely. The relevant reports and results should be included in the technical file.

The technical file must be available to the competent authorities of the member states for at least 10 years following the date of manufacture of the machinery. This will mean extensive changes in document management for manufacturers of partially completed machinery.

The manufacturers of partially completed machinery are expressly permitted to provide the assembly instructions in one EU language – it need not necessarily be the language of the country of assembly.

2.4 Group Two – Implications for the wind turbine industry

The situation as outlined above in relation to Group Two (manufacturers of partially completed machinery) is the most relevant aspect in relation to the situation facing the wind turbine industry and the fitting of lift equipment.

This example would occur if the lift is manufactured by one party and the rest of the unit is manufactured by another. The components would then be taken to site and assembled accordingly. Under the Directive, the obligations for partially completed machinery are considerably expanded from the point of view of design, instruction and documentation, as outlined above. The Directive would require a Declaration of Incorporation, which would include details of which safety requirements of the Directive have been applied and complied with.

Further, under the Directive it would be essential for new documentation to be provided in relation to general

description of the machinery, overall drawings of the machinery and drawings of the control circuits, as well as documentation on risk assessments.

As such it would be necessary for all parties involved, for example, the manufacturer of the turbine and the manufacturer of the lift, to ensure that all the relevant documentation as detailed above is adequate and complies with the Directive.

[It should also be stated that the person/company combining the PCM with the wind turbine must then issue a Declaration of Conformity for the combination, CE mark it and hold a technical file with the details of the combination and its risk assessment, together with the Declarations of Conformity/Incorporation for the parts combined.]

2.5 Group Three – Manufacturers of components

The Directive contains much stricter requirements, of which some additional suppliers must also take note. Such suppliers having specific duties are limited to manufacturers of safety components, lifting accessories, chains, ropes and webbing, and removable mechanical transmission devices, and they should be particularly aware of the requirements of the Directive to ensure compliance.

All these components are now equated with actual machines. The same formal and material requirements as for completed machines therefore apply to them. That means that the basic Health & Safety requirements (Annex I of the Directive) are to be observed and a Declaration of Conformity according to Annex II A of the Directive has to be prepared. In addition, a CE marking is to be attached and the user instructions must be in the language

of the user's country. In addition, the technical documentation in accordance with Annex VII A of the Directive is to be prepared and made available if an authority demands to inspect it.

(a) Individual Components

A safety component, in the meaning of the Directive, is a component:

which serves to fulfil a safety function, which is independently placed on the market, the failure and/or malfunction of which endangers the safety of persons and which is not necessary in order for the machinery to function or for which normal components may be substituted in order for the machinery to function.

(b) Lifting Accessory

The phrase "lifting accessory" refers to:

a component or equipment not attached to the lifting machinery allowing the load to be held, which is placed between the machinery and the load or on the load itself or which is intended to constitute an integral part of the load and which is independently placed on the market. Slings and their components are also regarded as lifting accessories.

The two individual areas identified in 2.5(a) and 2.5(b) above are specifically concerned with safety components and lifting accessories. Although not obviously applicable with regards to this advice, they should be considered and applied by the relevant parties.

2.6 Group Three – Implications for the wind turbine industry

The specific requirements of the Directive as outlined would be applicable where an existing wind turbine was in situ and the fitting of a lift was then required. The introduction of the Directive requires stricter regulations of which additional suppliers should be aware. It is necessary for the suppliers (if they fit the lift) to complete a Declaration

of Conformity to ensure compliance.

For ease of reference, a Declaration of Conformity is a declaration that has been made by the manufacturer of equipment stating that the particular piece of equipment (combination of lift and turbine in this case) conforms to the requirements of an EU Directive. The Declaration of Conformity is issued by the manufacturer to accompany each item that is placed on the market or put into use (e.g. if built for self-use).

2.7 Group Four – Manufacturers of electrical and electronic products

The limits of the application of the low-voltage Directive 2006/95/EC are intended, by the Directive, to be easier to identify. To date, a rather unclear rule based vaguely on the degree of danger has applied. The actual attribution was left to each manufacturer. The Directive excludes certain electrical and electronic products if these products fall under the low-voltage Directive 2006/95/EC. The purpose of this provision is a mutually exclusive application of one or other Directive. In addition, high-voltage equipment, such as controlling devices or transformers, is not covered by the scope of application of the Directive 2006/42/EC. Manufacturers of these electrical products must therefore concern themselves with the exclusion criteria and a clear internal attribution.

Although this final group is not directly applicable it is included at this stage for completeness.

3 Importation of Machinery from Outside the EU

In relation to items of machinery being imported from countries outside the EU the position is that, if the machinery falls within the scope of the Directive, then it will need to be compliant. There will be an obligation both on the importer

as well as the exporter to ensure compliance – if the machine is not CE-marked by the company based outside the EU then the importer takes on the full responsibility as the “manufacturer”.

4 Litigation – Product Liability/Product Safety/Health & Safety

Non-compliance with the provisions of the Machinery Directive can potentially leave an organisation exposed to the prospect of litigation. In product liability litigation, the courts have deduced from infringements of the safety requirements of the Machinery Directive that a failure to achieve the required safety standards can result in a successful action under the appropriate product liability law; this is mostly established in detail by an expert report. Compliance with the requirements of the Machinery Directive is not only a protection against official measures of market surveillance but also minimises the risks in relation to product liability.

5 Narrow Compliance/Conflict of Regulations

The Directive is directly applicable to the design, construction and placing on the market, or putting into service, of machinery. As such the Directive ensures the total harmonisation of the regulations in force throughout the European Community. Member states may not introduce national provisions that go beyond, overlap with or contradict the provisions of the Directive. However, under Article 15 of the Directive, member states remain free to regulate the installation and use of machinery in accordance with the relevant provisions of Community Law. It is vital that these regulations do not restrict the free movement of machinery that comply with the provisions of the Directive.

It is essential to note that national regulations on the installation and use of machinery or their application must not lead to the modification of machinery that does not comply with the Directive. The following are some examples of the subjects that may be covered by national rules on the installation and use of machinery:

- The installation of machinery in certain areas, such as, for example, the installation of cranes in urban areas or the installation of wind generators in the countryside;
- The use of mobile machinery in certain areas, such as, for example, the use of off-road vehicles in areas open to the public or the use of certain types of agricultural machinery close to dwellings or public roads; and
- The circulation of mobile machinery on public roads.

Additional requirements to those under the Directive can be found in the national regulations implementing the provisions of the Community Directives relating to Health & Safety at work.

These additional regulations are based on Article 137 of the EC Treaty relating to the protection of workers' Health & Safety, and set a minimum requirement, which member states may exceed if they consider it appropriate. Consequently, it is necessary to consult the national regulations in force in each member state in order to identify the relevant obligations.

It is important to note that organisations will still be required to comply with their obligations under other applicable regulations, such as the Provision and Use of Work Equipment Regulations 1998 (“PUWER”), the Lifting Operations and Lifting Equipment Regulations 1998 (“LOLER”), the Construction, Design and Management Regulations 2007 (“CDM”) etc. For example, under LOLER it will

still be essential that the requirement to examine lifts every six months is complied with. [Note that the regulations listed above do not (and cannot under EU legislation) impose requirements on the design of the item of machinery that is not required by the Machinery Directive.]

6 Notified Bodies

The Directive under Article 14 sets out the provisions relating to Notified Bodies. Notified Bodies are defined as being independent, third-party conformity assessment bodies entrusted with the conformity assessment procedures referred to in the Directive. The terms “Notified” refers to the fact that such bodies are notified by the member states to the Commission and to other member states.

The assessment, appointment and monitoring of the Notified Bodies is the exclusive responsibility of the member states.

When notifying a Body for conformity assessment according to the Machinery Directive, the notifying authority of the member state concerned must indicate the category of machinery for which the Body has been designated.

[Note lifts and certain safety equipment are listed in Annex IV of the Machinery Directive, and unless an item is built fully to a harmonised standard listed in the OJ it must go through a Notified Body for third-party conformity assessment.]

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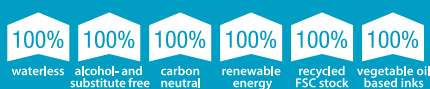
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Our vision is of renewable energy playing a leading role in powering the UK.

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Acting as a central point of information and a united, representative voice for our membership, we conduct research; find solutions; organise events, facilitate business development, lobby and promote wind and marine renewables to government, industry, the media and the public.

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