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HEALTH AND SAFETY SEMINAR

26 APRIL 2007 GLASGOW UK

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HEALTH AND SAFETY DURING THE DESIGN, CONSTRUCTION AND OPERATION OF ONSHORE WINDFARMS

AN HSE PERSPECTIVE

BERNARD WARDEN & ISABELLE MARTIN

HSE SCOTLAND

HSE’s ROLE

- To ensure health and safety during the construction and use of wind farms
- CDM and Work at Height Regulations
- Clients creating the right ‘tone’
- Collaboration between all parties to ensure compliance and that innovation becomes standard practice in the shortest possible time
- Consistency

PRINCIPAL HAZARDS

- Work at height
- Infrastructure development
- Lifting operations
- Electricity and moving/rotating equipment
- Remote sites / adverse weather conditions / difficult ground conditions

RISK’s

- Falls
- Left suspended
- Cardio-vascular illness
- Musculoskeletal conditions
- Plant / crane overturn
- Excavation collapse
- Falling items

RISK’s continued

- Electrocution
- Entrapment in machinery
- Delay in rescue
- Hypothermia / heatstroke
- Hygiene
- Remote work risk taking

ALL OF THE ISSUES MENTIONED COULD AFFECT PERSONS DURING THE CONSTRUCTION AND OPERATION OF THE FACILITY

WHAT HAPPENS WHEN THINGS GO WRONG?

- Could be a long time (hours) before others are aware of a problem
- Where are you?
- Can you communicate with others
- Who do you call when your in trouble
- How will they respond
- Rescue (just getting back to the site compound once located and recovered) could take hours
- Journey from rescue location to site boundary likely to be uncomfortable

EXPERIENCES FROM A RECENT EMERGENCY EXERCISE

- 3 separate counties, 4 police divisions, 3 fire service divisions - Ambulance service?
- Outcome without planning?
- Outcome with planning, knowledge of the correct emergency service to contact, a pro-active site management team and exceptional weather
- Lesson:- prevention always better than cure but ***on wind farms its crucial.***

HOW CAN INCIDENTS BE AVOIDED?

- Make the most of all available expertise and experience
- Identify risks and controls as early as possible
- Plan!
- Insist on innovation and best practice on the part of designers, manufacturers and contractors
- Adopt effective sequences of work during construction
- Adopt good management systems and supervision
- Consider the end user during the construction design phase

MORE DETAIL

- Design out risk
- Substitute with safer alternative
- Safe means of access and egress
- Safe working position preferred to fall arrest
- Consider and manage risks to health
- Reliance on ppe and provision of training as the only controls features low in prevention control hierarchy
- Ladders ,, ,,

EXAMPLE – TOWER ACCESS

Advantages in using lifts:-

- Much easier access for people and equipment
- No recovery time required
- Minimises potential cardiovascular and MSD problems
- Easier rescue for the vast majority of likely scenarios
- Staff retention improved

ADVANTAGES (continued)

- Easier to control welfare/hygiene issues
- Reduces work at height risks by reducing the need to climb/descend and the need to work over open hatch in lower part of the nacelle
- Minimised management / supervisory / training requirements for visiting personnel

TOWER ACCESS continued

- Disadvantages:-
- Cost (economies of scale)
- Maintenance and running cost requirements
  The advantages clearly out weigh the disadvantages - HSE inspectors will be taking a strong enforcement line on this particular issue

HSE EXPERIENCES SO FAR

- Mixed
- Some sites fitted with lifts and good emergency planning arrangements with due regard to CDM and some good work on safety culture improvements
- Others not complying with CDM for a number of reasons
- Client directly appointing turbine erectors
- PC not having management control over specialist contractors

HSE EXPERIENCES (cont’)

- Retro fitting costs approximately three times more than installation during construction
- Clients seeking to avoid responsibility by appointing manufacturer to run site for an agreed number of years post construction
- Pre-employment health checks non-existent or inadequate therefore placing persons at risk

HSE’s OBJECTIVES

- Ensure reasonable practicability (during construction and operation)
- **Minimise lost time and additional expense during construction and operation through early identification and management of risks**
- Apply CDM principles (pass on industry best practice and contribute to design improvements)
- Consistency of approach (will result in equality of message, an even playing field and economies of scale)
- **A successful and sustainable industry that does not place people at unnecessary risk**

STRATEGY

- Use internal communications networks to keep HSE inspectors in all relevant divisions and geographical areas up to date
- Ensure early involvement with proposed projects
- Set up good two-way communication links with the industry and nominated points of contact

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Diving on Wind Farms and other alternative energy projects

Simon Norton
HM Inspector of Health and Safety
(Diving)

Programme

- Which ACoP for the job?
- HSE's expectations for diving in support of offshore wind/tidal energy installations
- The role of the client
- Questions/Discussion

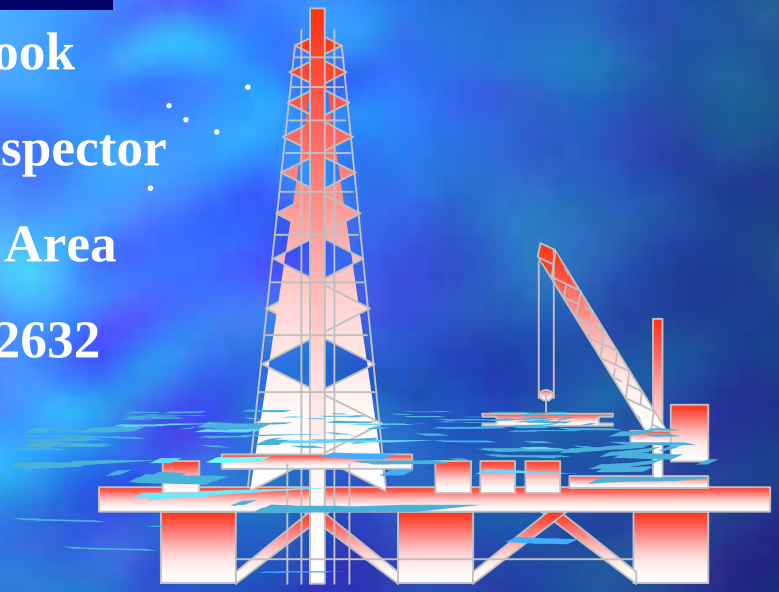
Offshore Safety Division
Specialist Diving Group

Peter Cook

Principal Inspector

Northern Area

01224 252632



Chris Sherman

DOST (London)

Chief Inspector of Diving

020 7717 6759

Judith Tetlow

Principal Inspector

Central Area

01604 738310

Steve Walker

Operations Manager

01603 828001

Based in London

Peter Sieniewicz

Principal Inspector

Southern Area

01752 276303

HM's Inspectors of Health & Safety (Diving) Central Team (OSD4.6)

☎ 01603 828000 Fax 01603 828050

Judith Tetlow
Northampton
Tel 01604 738310

Doug Stewart
Manchester
Tel 0161 952 8239

Jim McCormick
Newcastle
Tel 0191 2026219

Simon Norton
Norwich
Tel 01603 828017

The Diving At Work Regulations 1997 (DWR)

Seek to control the hazards associated with diving at work. They apply to all commercial diving in Britain. Practical guidance on how to comply with these regulations is contained in five **Approved Codes of Practice (ACOP's)**

Diving at Work Regulations

- Clients and Others
- Diving Contractor
- Project Plan & Risk Assessment
- Team size & competence
- Equipment & maintenance
- Supervisors
- Divers
- Medicals

Which ACoP?

- **Offshore Diving Projects**
  - Oil & Gas Installations & Pipelines outside 12 mile limit
  - Oil & Gas Installations & Pipelines within 12 mile limit
  - Saturation or Closed Bell diving
  - Diving from a DP vessel
  - Diving below 50m

Which ACoP?

- **Inland / Inshore Diving Projects**
  - Civil Engineering and Marine related projects
    - Inshore - within 12 mile limit
    - Inland – docks, harbours, rivers, reservoirs
- Scientific/Archaeological Projects
  - Possibly for pre-construction surveys, environmental impact, etc
- Media Projects
  - Unlikely, but possible for TV documentary?

HSE's Expectations for Diving Operations on Wind Farms

- Hard lessons learnt by the offshore (oil & gas) diving industry. Do not want to see the offshore (alternative energy) industry re-learning these lessons.
- Established HSE/industry guidance and practice should not be disregarded.
- Risk assessment
  - Weather, tidal stream, vessel traffic
  - Distance from shore and casualty evacuation (RCC)
  - Competence and experience

Clients

Regulation 4

- Every person who to any extent is responsible for, has control over or is engaged in a diving project or whose acts or omissions could adversely affect the health and safety of persons engaged in such a project, shall take such measures as it is reasonable for a person in his position to take to ensure these Regulations are complied with.

How Can Clients Fulfill Their Legal Duties?

- Appoint a competent diving contractor capable of undertaking the duties
- Ensure the site is safe to use
- Consider activities within their control which may affect the safety of diving operations
- Identify known hazards to the diving contractor e.g. underwater obstructions and contaminated water
- Support the supervisor and diving contractor in the event of an emergency

UK Health and Safety Legislation

- Health & Safety at Work Act 1974
- Diving at Work Regulations 1997
- Management of Health & Safety at Work Regulations 1992
- Construction (Design and Management) Regulations 2007
- Lifting Operations & Lifting Equipment Regulations 1998 (LOLER)
- Provision & Use of Work Equipment Regulations 1998 (PUWER)
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR)

Diving Issues (1)

- Recompression Chambers (ACoP requirement)
  - Exceeding bottom time
  - DCI
  - Inability to safely reach shore
  - Must be self-sufficient i.e should not rely on helicopter and coastguard (2 hour rule)
  - Chamber operator must be competent
  - Risk Assessment
    - visibility, tides, activity, distance to shore, means of transport, weather and if there is the potential to exceed planned depth.

Diving Issues (2)

- Suitability of vessel/diving platform
- Suitability of mooring system
- Emergency procedures
- PPE and diver owned suits
- Access/Egress
- ELCI
- Medicals
- LOLER

Diving Issues (3)

- Need to plan and involve various disciplines needed to complete project at an EARLY stage
  - Vessel
  - Diving
  - Other Contractors
  - Specialist advice

Summary

- Hard lessons learnt by the offshore (oil & gas) industry. Do not want to see the offshore (alternative energy) industry re-learning these lessons.
- Established HSE/industry guidance and practice should not be disregarded.
- Risk assessment and project planning are key elements.
- Management of change should not be underestimated.

Questions?

Simon Norton

T: 01603 828017

E: simon.norton@hse.gsi.gov.uk

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Pinsent Masons

Corporate Homicide and Accident Investigations

Tom Stocker, Senior Associate

Criminal Liability For A Fatality

Offences enforced by HSE:

- Health & Safety at Work etc Act 1974 (HSWA)
- Health & Safety regulations

Offences enforced by Police/CPS/ PF

- Manslaughter/Culpable Homicide

Directors Disqualification Act 1996

Corporate Manslaughter

- Current law to convict a company
  - Identify an individual within the corporation who could himself be convicted of manslaughter; then
  - Identify the same individual as representing the “directing mind of the company”
- No convictions in Scotland
- Only 7 convictions in England
- Virtually impossible to convict a large corporation

Corporate Manslaughter and Corporate Homicide Bill

- Introduces new manslaughter offences for corporations
- No “directing mind” test
- Aggregation allowed
- Penalty – unlimited fine
- Timetable – October 2007?
  - Bill had its Second Reading in the House of Lords on 19/12/06
  - On its way back to Commons!

The Offence Is Committed If:-

- “The way in which [the organisation’s] activities are managed or organised:
  - (a) causes a person’s death;
  - (b) amounts to a **gross breach** of a relevant duty of care owed by the organisation to the deceased” (section 1(1))

    and
- The way in which its activities are managed or organised by its senior management is a *substantial element* in the breach” (Section 1(3))

What is Senior Management?

- Senior management, in relation to an organisation, means the persons who play significant roles in:

- (a) The making of decisions about how the whole or a substantial part of its activities are to be managed or organised; or

- (b) the actual managing or organising of the whole or a substantial part of those activities (Section 1(4)(c))

What is a gross breach?

- Falling far below what can reasonably be expected in the circumstances
- Jury must consider:
  - Failure to comply with health and safety legislation
  - Failure to comply with health and safety guidance (ACoPs and HSE Guidance)
  - Policies, systems, attitudes and accepted practices

Why is this so important?

- Regulatory impact assessment:
  - 5 more corporate prosecutions per annum
  - Numerous more cases will be investigated as homicide/manslaughter
- Change in attitude in favour of investigating organisations for manslaughter
- HSE Enforcement Report

  “We are working increasingly with the police on manslaughter investigations, and estimate that this is taking up about 10% of our total investigation and enforcement resource.”

Accident Investigation

Two areas of concern:

- Internal accident investigation reports
- Interviews

Accident Investigation Reports

- To assess risk of liability
- Learn lessons/ prevent recurrence

BUT

- Admission of liability
- HSE can compel disclosure (unless privileged)
- Incriminating evidence

Can the Report be covered by privilege?

- Dominant purpose of the Report must be the contemplation of legal proceedings

- First - involve in-house lawyer or instruct external solicitor and document the lawyer's request
- Then conduct the investigation
- Finally head the report: draft/privileged/addressed to lawyer - for purposes of obtaining legal advice

- Restrict circulation
- Be prepared for report to be read out in open court

Questioning and Interviews

1. Right to silence – No compulsion to answer

- Notebook questioning
- Voluntary interviews - “helping the police/HSE with their enquiries”
- Interviews under caution
- Risk of self-incrimination

2. Compulsory (S. 20) – must answer questions

- but protection against self-incrimination

Ask for copies of statements

Obtain legal advice

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Offshore windpark Egmond aan Zee

Huub den Rooijen
Senior business development manager
Shell WindEnergy

26 April 2007
BWEA Health and Safety seminar, Glasgow, UK

Overview

- Project background
- Approach to Health & Safety management
- Construction experience
- Summary

Wind: Developer, Owner & Operator

Harburg, Germany
3.6MW

Blyth Offshore, UK
3.8MW

White Deer, Texas 80MW

Cabazon Pass, California
41MW

Whitewater Hill, California
61.5 MW

Rock River,
Wyoming
50MW

Brazos, Texas
160MW

La Muela, Spain
99MW

Colorado Green
162MW

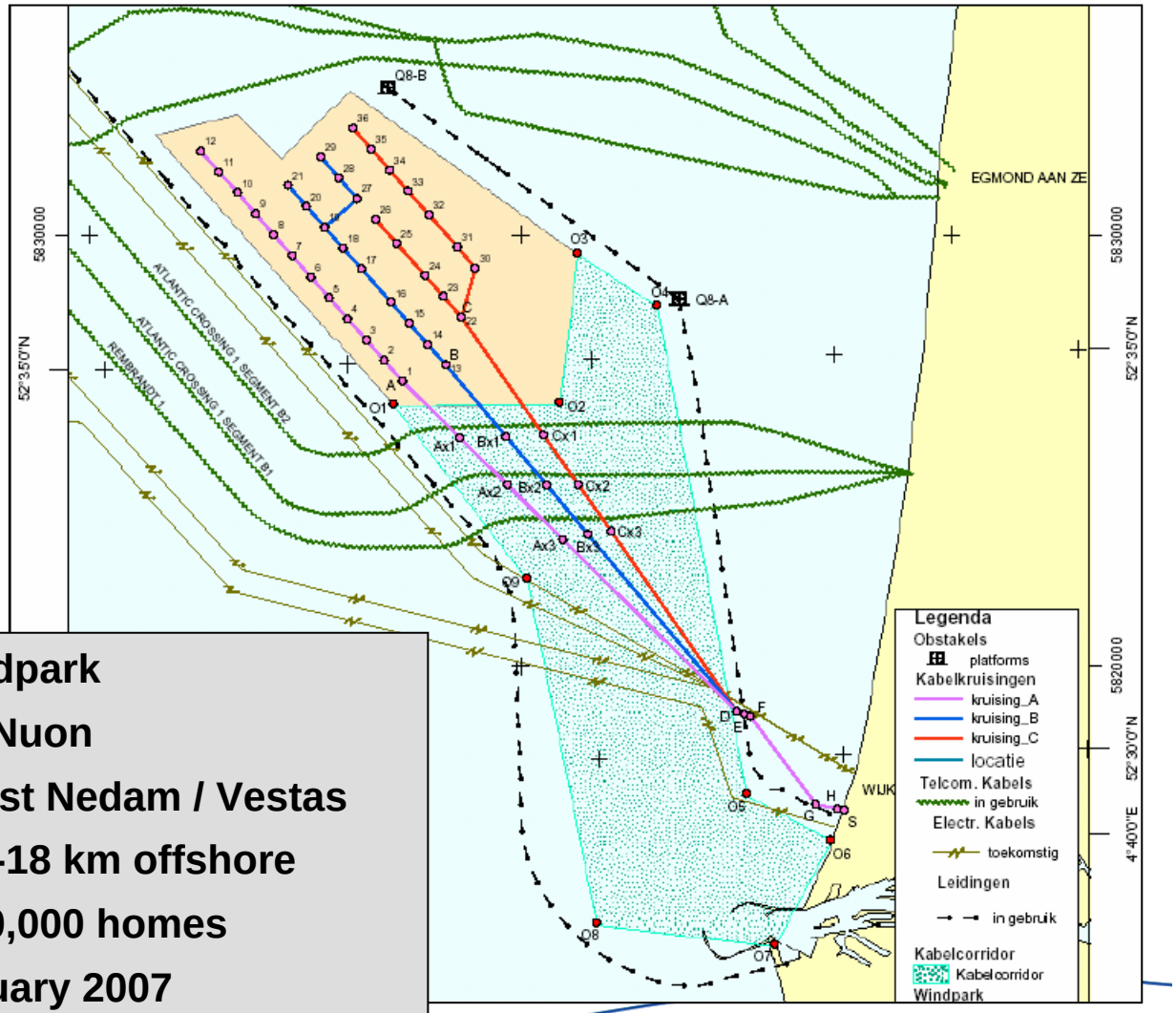
Top of Iowa
80MW

NoordzeeWind, Netherlands
108MW

Mount Storm,
West Virginia -
under construction
160MW

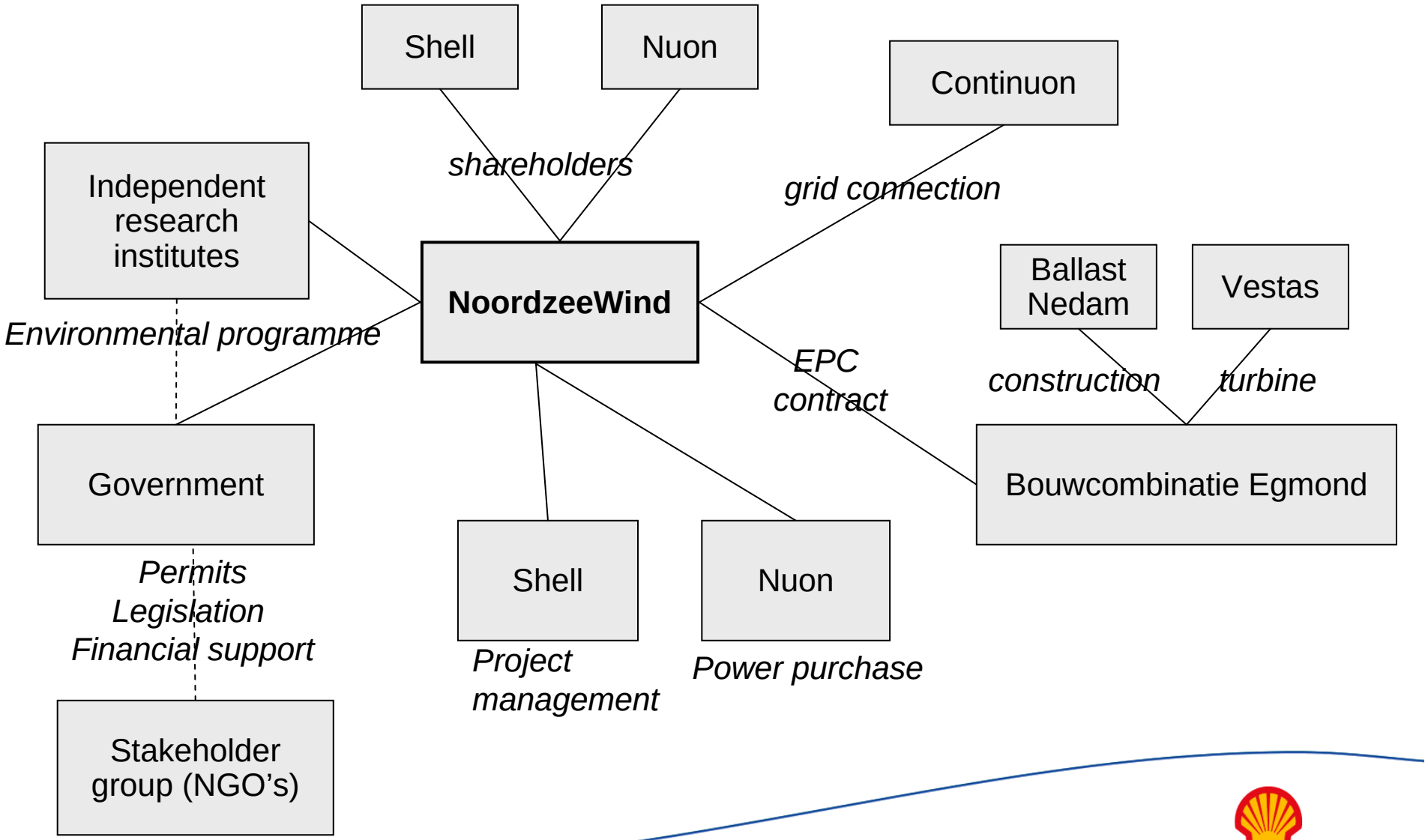
- Total capacity*
- **849 MW (Shell share: 416MW)**

Offshore windpark Egmond aan Zee



- First Dutch offshore windpark
- Developed by Shell and Nuon
- Built under EPC by Ballast Nedam / Vestas
- 36 turbines, 108 MW , 10-18 km offshore
- Clean power for over 100,000 homes
- In operation since 1 January 2007
- Meteomast 115 m, operating since 2004

Commercial structure



Approach to HSSE management

- **HSSE is line responsibility**
- **Key standards and policies included in the main EPC contract to set expectations and get ‘contractual teeth’**
- **EPC Contractor is responsible for HSSE management onshore and offshore, but client is involved throughout**
- **Develop a co-operative pro-active attitude from both client and contractor**
  - One common target
  - Visible senior-level management commitment
  - Integrate HSSE at all levels in project organisation
  - Frequent and transparent reporting
  - No-blame culture

HSSE Management System

Basic techniques

- **Simple messages**
  - 3 Golden Rules
  - Report it !
  - Incentives
  - Red / yellow cards
- **Joint “lunch and learn” sessions**
  - Explaining the HSSE Management System
  - Competence assurance
  - Rule breaking
  - Preventing hand injuries
  - Electrical safety
- **Joint HAZID and HAZOP workshops during design and construction phase**
- **Joint audits and inspections**
- **HSSE included in all progress meetings**
- **Onsite representatives at all locations**

3 Golden Rules

You and I *:*

- ***Comply*** *with the law, standards and procedures*
- ***Intervene*** *in unsafe or non-compliant situations*
- ***Respect*** *our neighbours*

Safety statistics (construction phase)

Construction duration (from notice to proceed until start of operations)	**19 months**
Exposure hours	**433,000 (NZW + BCE + others)**
Average staff count (assuming 40h week)	**130**
Maximum nr of vessels at any one time	**30 (late July 2006)**
Nr of occupational illnesses	**0**
Nr of lost-time incidents (LTI)	**0**
Nr of medical treatment cases (MTC)	**7**
Nr of safety reports	**198**

Definitions

Lost Time Injuries (LTI)
The sum of injuries resulting in fatalities, permanent total disabilities and lost workday cases, but excluding restricted work cases and medical treatment cases.

Medical Treatment Case (MTC)
Any work related injury that involves neither lost workdays or restricted workdays, but which requires treatment by a physician or other medical specialist.

Total Reportable Cases (TRC)
The sum of injuries resulting in fatalities, permanent total disabilities, lost workday cases, restricted work cases and medical treatment cases.

Lost Time Injury Frequency (LTIF)
The number of lost time injuries per million exposure hours.

Total Reportable Case Frequency (TRCF)
The number of total reportable cases per million exposure hours.

Definitions as used by Shell.

Medical Treatment Cases

	INCIDENT	CAUSE
1	Individual fell down open spud hole on transport barge, and received a laceration to his right knee. Happened at night whilst turning off nav light on barge.	Lack of risk assessment. Lack of proper tools, e.g. flashlight.
2	Individual fell on deck and suffered 3 deep cuts to the back of the right hand.	Could not establish.
3	Individual stumbled backwards over a block and the wire he was pulling landed on top of his leg, causing a hematoma.	Poor housekeeping
4	Individual was torquing bolts inside the tower. The individuals right pinkie finger was caught between the tool and bolt, damaging finger tip.	Not paying attention?
5	During transport pontoon unmooring the right hand of the individual was caught between tug boat fender and stern navigation light holder on the pontoon. Bruised hand.	Poor equipment design.
6	Individual slipped whilst walking up the first stair, and fell back to the deck. To break the fall individual placed the left hand back which hit the deck first.	Did not hold hand rail.
7	The individual was positioning a pin into a shackle. The shackle moved slightly and the individual slammed the pin in and caught his right ring finger between the pin and the shackle. Safety glove did not prevent top of finger being damaged, which needed stitches.	Not aware of risks. Not paying attention.

!

MTC 1 – lack of risk assessment

Picture #1 - Shadows from lights of Tugboat

MTC 1 – lack of risk assessment

Picture #2 - open hole with flash from camera.

Picture #3 – Spud Leg Hole

MTC 5 – poor equipment design

Edge of navigation Light holder extends pass the barge.

No room for complacency

- **Egmond safety performance**
  - LTIF = 0
  - TRCF = 16 (7 incidents on 433,000 hrs)
- ***This is good, but not good enough.***
- **All incidents were preventable – none was direct result of innovative equipment or technology!**
- **Shell Group 2005**
  - LTIF = 0.9
  - TRCF = 2.5
- **(Offshore) wind has come a long way, but has a long way to go still.**

UK civil construction TRCF>50

Source: NoordzeeWind (Egmond stats); www.shell.com (Shell stats).

Summary

- **Offshore Windpark Egmond aan Zee – on time, on budget, and to high safety standards**
- **Stringent project management is pre-requisite, both from client NoordzeeWind and from contractor Ballast/Vestas**
  - Preparation, preparation, preparation
  - Work method statements, risk analyses, toolbox talks
  - Feedback through safety reports
  - “Si vis pacem, para bellum”
- **Industry is on right path, but needs to improve further**

www.noordzeewind.nl
www.shell.com/renewables

Thank you for listening.

Huub den Rooijen
Shell WindEnergy BV
The Netherlands
Tel: +31 70 377 3098
Email: huub.denrooijen@shell.com

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