RINA

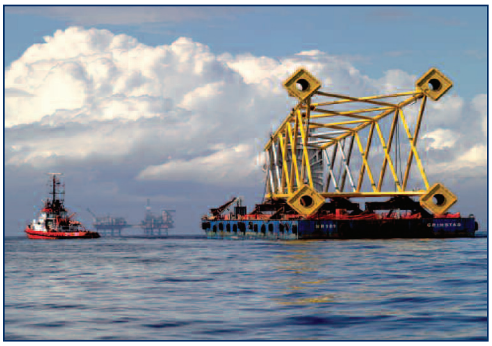
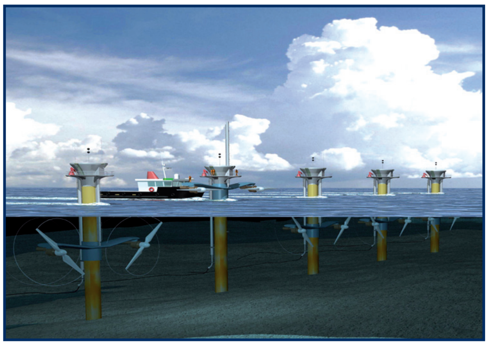
The Royal Institution of Naval Architects

International Conference

Marine & Offshore Renewable Energy

26 - 27 September 2012
London, UK



day 1

09.00 – 09.30 **COFFEE, REGISTRATION**

09.30 - 10.05 **ECONOMIC STUDY OF FLOATING WIND FARMS**
R. Pérez, Universidad Politecnica de Madrid & M. Lamas, Universidad de la Coruñ, Spain
Floating wind parks are wind farms that site several floating wind turbines closely together to take advantage of common infrastructure such as power transmission facilities. Cost is an essential consideration for the successful commercial deployment of the present floating wind turbine concepts into large scale offshore wind farms. The wind turbine used in the present study is assumed to be a marinized version of an onshore system. The same would be the case if a smaller or larger wind turbine system were to be used. The weight of larger wind turbines may be easily supported by a floater of larger displacement.Thus, the major objective of this paper is to demonstrate, with a simple static cost model, that platform cost can be brought into this economic range.

10.05 - 10.40 **RISK ASSESSMENT FOR THE INSTALLATION AND MAINTENANCE ACTIVITIES OF A LOW-SPEED TIDAL ENERGY CONVERTER**
I. Lazakis, O. Turan, University of Strathclyde & Ted Rosendahl, Minesto UK ltd, UK
The work presented in this paper, is part of the Deep Green project, which signifies the development of a power energy converter/device for employment in low-speed tidal currents. It focuses on the initial steps to investigate the ways on how to minimize the risks during handling, operation and maintenance (O&M) activities of the full-scale device particularly in offshore operations. As a first step, the full-scale device offshore installation, O&M tasks are considered. A thorough review and examination of the past and current risk analysis methods in the offshore renewables and oil and gas sectors is carried out in order to achieve the optimum methodology for implementation in the proposed innovative tidal energy generator design. The overall risk analysis and decision making methodology is presented including the Hazard Identification (HAZID) process which is complemented with a risk matrix for various consequence categories including personnel Safety (S), Environmental impact (E), Asset integrity (A) and Operation (O).

10.40 - 11.15 **CLASSIFICATION AND PROJECT MANAGEMENT OF HYBRID WTI JACK UP VESSELS**
J. Lee, D. Ok, L. Campbell, DNV, United Arab Emirates
Over the past decade, increasing concerns about global warming and marine pollution, together with rising oil prices, has spurred the development of new regulations and tighter limitations on carbon emissions, leading to new research, technology and investment in renewable energy. In order to meet market demand towards installation and maintenance of the next generation offshore wind farms, a series of two Wind Turbine Installation (WTI) vessels of novel Jack-Up type, which are one of the largest size of this vessel type, were designed in Europe, constructed in the United Arab Emirates and classed by Det Norske Veritas. This paper presents some of the project management and technical challenges involved in the construction of these novel and complex hybrid vessels, relative to classification rule applications and certification of the product.

11.15 - 11.45 **COFFEE**

11.45 - 12.20 **ASSESSMENT OF SHIP'S EMISSIONS USING RECOVERY SYSTEMS**
S. Al-Zubaidy, Nazarbayev University, Kazakhstan
In the shipping Industry, fuel consumption is becoming a critical issue with the increase in fuel prices and the pressure to reduce overall carbon emissions. Reduction in fuel consumption could be achieved by either recovering the heat from the engine exhaust or by using green technology to assist propulsion using direct wind power. The work presented is a comparative assessment of the three main types of ships, namely oil tankers, container carrier ships and LNG Carriers. Results of the study illustrate that, the CO2 emission from 3,60,000 m3 Cargo capacity oil tanker using 10% Heat recoveries can achieve 11.07 % Energy Efficiency Design Index improvement and reduction of 16,358 tones of CO2 emission per year. Using 32ton capacity Sail-kite (sky sail) can achieve 10.6 % EEDI improvement and 15,664 tons CO2 emission reduction per year.

12.20 - 12.55 **ECONOMIC PROFILING OF WIND ENERGY**
S. Yasseri, Safe Sight Technology Ltd, UK
Portfolios of electricity generation increasingly include wind energy alongside other modes of power generation. The capital costs and competitiveness of electricity generation alternatives will strongly influence investment in renewable energy technologies. The value of an asset lies not only in the amount of direct revenues that it is expected to generate, but also in the options that it creates for flexible decision making in the future as circumstances change. The current valuation methods include net present value, internal rate of return, decision trees and real options. The expected net present value (ENPV) technique, which is a type of decision tree model, is also employed. This paper develops a practical and operationally relevant framework for the economic appraisal of wind power generation. Economic evaluation provides valuable insight to improve the viability of wind energy. This article also compares and contrasts various valuation methods, and highlights their relative merits as a decision making tool.

12.55 - 13.55 LUNCH

13.55 - 14.30 **RESEARCH ON INTELLIGENT ELECTRICAL CONTROL SYSTEM IN SMALL STAND-ALONE WIND POWER EQUIPMENT IN MARINE ENVIRONMENT**
Y. Zhao, Northeast Normal University, China
Although it provides many beneficial conditions by offshore and coastal regions to develop stand-alone wind power system, like fruitful wind energy and huge demands, special environment brings great challenge to safe and stable operation of equipment. Small stand-alone wind power system is widely used in marine environment like islands and coastal regions due to its flexible installation and good adaptability. Distributed power supply mode can excellently meet the power demand of rural and dispersive users. We present a 15KW wind turbine which owns intelligent electrical control system. It operates in marine environment independently. By aerodynamic analysis and algorithm research, we devise a special-structure passive yaw mechanism which belongs to tail wind device normally.

14.30 - 15.05 **THE TURBINE FOUNDATION LINER CONCEPT - ENVIRONMENTALLY FRIENDLY AND COST EFFECTIVE ALTERNATIVE FOR THE INSTALLATION OF OFFSHORE WIND TURBINE FOUNDATIONS**
J. Brouwer, Dutch Offshore Innovators BV, The Netherlands
In 2009 the first floating installation vessels from the offshore Oil & Gas industry being utilized to install offshore wind turbine foundations. Ever since there has been an interest in concepts for floating installation vessels, as opposed to jack-up installation vessels. Since the middle of 2010, DOI has been working on the TFliner, a vessel designed for the installation of monopiles and transition pieces, as well as jacket type foundations for offshore wind turbines. An innovative system has been developed for the handling of the foundations that is strongly based on technology which is borrowed from the offshore Oil & Gas industry. The question rose as how to achieve a good operability in open sea. The answer to this was found in a novel, sea kind hull shape that keeps motions to a minimum, in combination with active roll stabilization that further increases the operating window.

15.05 - 15.35 **COFFEE**

15.35 - 16.10 **OFFSHORE FLOATING VERTICAL AXIS WIND TURBINES: ADVANTAGES, DISADVANTAGES, AND DYNAMICS MODELLING STATE OF THE ART**
M. Borg, M. Collu, F.P Brennan, Cranfield University, UK
The desire for more cost-effective wind farms has pushed for offshore projects to move further offshore and in deeper water depths: higher wind resources per unit area, ability to exploit new, wider sites (in particular for those countries with a limited shallow continental shelf), and partial or total elimination of visual impact. In this paper, the advantages and disadvantages of using vertical axis wind turbines (VAWTs) instead of horizontal axis wind turbines (HAWTs) on floating support structures are discussed. In the present work, the dynamics of a floating VAWT system is illustrated and modelling approaches are discussed. These include aerodynamics, hydrodynamics, mooring line dynamics, structural dynamics and control system dynamics.

16.10 - 16.45 **DESIGN CONSIDERATIONS FOR A FLOATING OTEC PLATFORM**
J. Ross, OTEC International LLC, USA
Ocean Thermal Energy Conversion (OTEC) generates power from temperature differences between warm surface water and cold deep water in tropical seas. Only now, OTEC appear commercially viable, because of rising oil prices, coupled with material and engineering innovations. Key to the commercial success of a floating OTEC plant is a platform that houses and protects the OTEC machinery. Although much of the platform technology is available from the offshore industry and from the ship design arena, there are important elements that require imaginative solutions unique to OTEC. This paper addresses a number of important platform issues and describes the design of a 25 MW OTEC spar platform that has received Approval in Principal from a leading classification society.

16.45 - DRINKS RECEPTION

day 2

08.30 - 09.00 COFFEE AND REGISTRATION

09.00 - 09.35 BIOFOULING ISSUE, GLOBAL IMPLICATIONS AND SOLUTIONS LINKED TO OFFSHORE BUSINESS
J. A. González, H.J.G. Polman, M.C.M. Bruijs, L.P. Venhuis & G. van Aerssen, KEMA Power Generation and Renewables, The Netherlands
Biofouling is a problem well known to manufacturers and researchers in various fields of knowledge. Along the last years it is also affecting to the offshore industry and its partners. The undesirable attachment of organisms to different kind of surfaces is able to create very deep impacts, both economic and operational. Besides that, there are another factors to take into account like the environmental impact of this phenomenon and the local government regulations, these are issues that require the wide attention of the global offshore community. The present article intends to show some of them and the potential application to offshore energy business in order to help to improve its operational costs and its impact to the environment.

09.35 - 10.10 THE USE AND APPLICATION OF CARBON FIBRE COMPOSITES IN TURBINE BLADES
L. McEwen & M. Meunier, Gurit UK Ltd, UK
The exponential growth in offshore wind turbine size in recent years and the rapid development of tidal turbines has brought new challenges to the blade designer. Fundamental differences in the operational environment produce different optimum structural configurations, driven by different design parameters. The primary drivers for wind blades are stiffness and weight and for tidal blades static and fatigue strength. Analysis shows that such drivers applied to new and future generations of turbine blades are hard to satisfy with traditional wind blade technologies. Carbon fibre composites, with their high stiffness and excellent fatigue behaviour, are able to contribute to the development of aerodynamically/hydro-dynamically and structurally viable solutions. This paper illustrates how intelligent structural design combined with an increased use of carbon fibre can lead to cost effective solutions to the design of the new generation of offshore wind and tidal turbine blades.

10.10 - 10.45 A REVIEW OF MODELLING TECHNIQUES FOR TIDAL TURBINES
P. Davies, Lloyd's Register Group Services Ltd. & D. Radosavljevic, Lloyd's Register EMEA
Tidal Turbines are, in comparison to other renewable technologies such as Wind Turbines, in the early stages of development. There are only a few devices that have been deployed at commercial scale and even these would still be considered prototype designs. To aid the design process modelling techniques are needed both for single turbines and arrays of turbines.
In this paper, methods that have been used for modelling tidal turbines and tidal inflow conditions are reviewed and also discussed is how methods developed for wind turbines can be adapted for tidal turbines. The accuracy and drawbacks of some of the modelling techniques are identified, based in part, on the experience that Lloyd's Register has in this area. The impact on design of the IEC design standard which is being developed for marine renewable devices will also be discussed.

10.45 - 11.15 COFFEE

11.15 - 11.50 FEEDFORWARD AND RECURSIVE NEURAL NETWORKS FOR VERY SHORT TERM 3D WIND FORECASTING
F. Tagliaferri, R.J Dow, I. Viola, Newcastle University, UK
The inconstant behaviour of the wind is a factor that must be taken into account when planning systems that have to rely upon wind energy. In order for wind power to be effectively and efficiently exploited, reliable forecasts on wind behaviour are required as they are helpful in saving costs coming from curtailments, in improving the safety of workers, and in reducing the risks of damages due to extreme weather conditions.
In this study we present a very short term wind forecast based on measurements with a three second time step using artificial neural networks, mathematical structures which in last years have been proven to be very powerful in simulating complex non linear systems. The data set consists in measurements of wind speed along the three axis. The models showed a good reliability on the very short term forecast, that can be iteratively extended to forecasts on short intervals (from 3 to 60 seconds).

11.50 - 12.25 THE OPPORTUNITIES AND LIMITATIONS OF USING CFD IN THE DEVELOPMENT OF WAVE ENERGY CONVERTERS
P. Schmitt, T. Witthacker, M. Folley, Queens University Belfast, Uk
K. Doherty, Aquamarine Power Ltd., Edinburgh
Most Wave Energy Converters (WECs) being developed are fundamentally different from known marine structures. Limited experience is a fundamental challenge for the design, especially issues concerning load assumptions and power estimates. Reynolds-Averaged Navier-Stokes (RANS) CFD methods are being used successfully in many areas of marine engineering. They have been shown to accurately simulate many hydrodynamic effects and are a helpful tool for investigating complex flows. The major drawback is the significant computational power required and the associated overhead with pre and post-processing. This paper presents the challenges and advantages in the application of RANS CFD methods in the design process of a wave energy converter and compares the time, labour and ultimately financial requirements for obtaining practical results.

12.25 - 13.25 LUNCH

13.25 - 14.00 CONNECTION OF MARINE ENERGY CONVERTERS: A CHALLENGING OPERATION
J. Beale, Woodgroup, UK
Electrical system design and connection requirements are often overlooked in the drive to commercialise wave and tidal projects. The same metocean conditions which make suitable sites attractive to developers present onerous challenges for installation and maintenance of the power take-off network for the array. Economically feasible developments will require output collection and modularity of components to reduce the high Capex involved in running multiple cables to shore. Prior utilisation of such systems to date may be limited to low-energy or deepwater installations; neither of which is expected at typical marine energy sites. This paper considers the options for connection system design for wave and tidal projects, and investigates the challenges inherent to each. The market-readiness of subsea connectors is also addressed and recommendations for marine energy developments are identified.

14.00 - 14.35 STANDING WAVE TUBE ELECTRO ACTIVE POLYMER WAVE ENERGY CONVERTER
P. Jean, SBM Offshore, Monaco
Over the past 4 years SBM has developed a revolutionary Wave Energy Converter. Floating under the ocean surface, the S3 amplifies pressure waves just like a travelling wave tube. Composed of only elastomers, the system is extremely flexible, environmentally friendly and silent. In this paper, we will describe the development process, with the key technological and financial partnership approach adopted by SBM. We will explain the fundamental physics by describing the wave to wire model. Then, we will present the results of the proof of concept model tests carried out in wave tanks and compare them with the W2W model. Finally, we will describe the road map from full scale prototype to first wave farms.

14.35 - 15.05 COFFEE

15.05 - 15.40 OCEAN WAVE TECHNOLOGY
J. Drake, Ocean Wave Technology, Australia
Fremantle based Ocean Wave Technology in Western Australia, have developed an innovative device to harness Wave Energy to produce clean and consistent electrical energy consisting of a series of vertical cylinders, operating as pumps, which when driven by the up and down motion from waves, drive water along a manifold pipe, into a turbine and generator housing, thus producing electricity.
The cylinders themselves contain both a sea driven external float, and an internal piston that acts to suck in sea water from the base, to then drive it along through a series of one way valves, out the top of the cylinder and along the manifold into the turbine.

15.40 - 16.15 WIND-TIDAL-SOLAR PV HYBRID POWER SYSTEM
K.K.Banerji, India
The system consists of two Helium filled inflatable Multistage Horizontal axis Reaction wind-turbines placed on the same shaft & tethered to the bottom of the sea. Besides, two air filled inflatable Multistage Horizontal axis Reaction hydro-turbines on the same shaft(generator placed between them), floating just below the water surface, will also be fitted to the above pair of tether.
The shape of both wind & hydro turbine is like a hollow cylindrical body, with blades fitted on its curved surface. While Wind-turbine being rotated by air flow, one of its flat-ends near periphery, is in contact with a perpendicularly placed small gear (located approx. in the center of the two turbines), which increases rpm. Wind-turbine surface embedded with solar Photo-Voltaic cells, transmits power through a slip ring-brush.

16.15 - GENERAL DISCUSSIONS

International Conference

Marine & Offshore Renewable Energy

26 - 27 September 2012
London, UK

To register, simply complete all sections of this form and return it with your payment to:

The Conference Department, RINA
10 Upper Belgrave Street,
London, SW1X 8BQ

TEL: +44 (0)20 7201 2401
FAX: +44 (0)20 7259 5912
E-MAIL: conference@rina.org.uk

TITLE (Dr, Mr, Eur Ing):

NAME (as it should appear on name badge):

POSITION:

COMPANY (as it should appear on name badge):

INVOICE ADDRESS:

POSTCODE:
COUNTRY:
TELEPHONE:
FAX:
E-MAIL:

CONTACT MAILING ADDRESS (if different):

POSTCODE:
COUNTRY:
TELEPHONE:
FAX:
E-MAIL:

PLEASE INDICATE YOUR PREFERRED METHOD OF PAYMENT:

I enclose a cheque for: (made payable to RINA) £

Please send me an invoice for : £

Bank Transfer details enclosed for: £

Please debit my credit card by: £

Card Number: (Visa/Amex/Mastercard)

Expiry Date:

Signature:

REGISTRATION FEE (Inc VAT*)	By 26/08/2012	After 26/08/2012
RINA MEMBERS:	£700	£800
NON-MEMBERS:	£800	£900
CONCESSIONS: *(Retired/Students etc.)*	£330	£330
PRINCIPAL AUTHOR	£125	£125
ADDITIONAL AUTHOR	£700	£700

The registration fee includes printed conference papers, lunch, refreshments, reception, a CD of the papers and presentations after the conference, and VAT

CONFERENCE PAPERS
Delegates will receive a copy of the conference CD-ROM which will include the presentations, this will be posted out around 10-12 weeks after the conference.

Aditional copies of the conference papers will also be for sale after the event in both print and CD ROM versions. If you would like to order copies, please fill in the relevant sections.

I am unable to attend the conference, please reserve me _______ set(s) of Conference proceedings

Papers @ **£110** (members) ☐ **£130** (non-members) ☐

CD ROM **£110** (members) ☐ **£130** (non-members) ☐

For a full list of the Institution's Conference papers, CD-ROM's and other technical publications please contact Billy Allen, Bookshop Assistant on +44 (0)20 7235 4622 or via e-mail at: publications@rina.org.uk

PAYMENTS
Payment must be made in pounds sterling by Eurocheque, cheque drawn on a bank with a UK branch address, credit card (VISA/Amex/Mastercard) or bank transfer. Please note RINA requires payment before the conference date.
Account Name: The Royal Institution of Naval Architects;
Account Number: 10042127; **Account Code:** 160016
Bank Address: Royal Bank of Scotland PLC, Belgravia Branch, 24 Grosvenor Place, London, SW1X 7HP, UK.
IBAN No: GB14RBOS16001610042127
SWIFT No: RBOSGB2L

*VAT: Under UK Customs and Excise regulations delegates from all countries are required to pay VAT on any course taking place in the UK. Delegates from outside the UK may be entitled to reclaim this cost.

VENUE
The Venue for the conference is the RINA headquarter, 10, upper Belgrave Street, SW1X8BQ, London, UK

EVENING DRINKS RECEPTION
Following the end of day one (26 September 2012), delegates are invited to attend an evening drinks reception at the conference venue.

ACCOMMODATION
Upon registration you will be provided with details of a hotel booking service offering reduced rate accommodation for conference participants.

CONTINUING PROFESSIONAL DEVELOPMENT
RINA Certificates of Attendance will be issued at the event, which contributes towards the Institution's Continuing Professional Development Scheme. For further details regarding the scheme please contact Giuseppe Gigantesco, Director, Professional Affairs on Tel: +44 (0)20 7235 4622 or e-mail: membership@rina.org.uk

STUDENT SPONSORSHIP
A number of sponsored places at this conference are available for Student Members of RINA. For more information, please contact Yuen Yee Pang, Professional Affairs, RINA on Tel: +44 (0)20 7235 4622 or e-mail:ypang@rina.org.uk.

PROMOTIONAL OPPORTUNITIES
Why not use this conference to promote your company's products and services? It provides an excellent opportunity to increase your profile and to network with a highly focused audience. We offer a number of cost effective options, including various conference sponsorship packages, exhibition space and literature distribution. If you are interested in any of these promotional opportunities please contact the Conference Organiser to discuss your individual requirements.

CANCELLATION CHARGES
Cancellations received in writing two weeks before the event takes place will be subject to administration charge of £200+VAT. Cancellations received after this time cannot be accepted and are subject to the full event fee. Delegates may be substituted; however, this must be sent in writing and confirmed with the conference Co-ordinator. It may be necessary for reasons beyond our control to alter the content and timing of the programme. In the unlikely event that RINA cancels the event for any reason, our liability is limited to the return of the registration fee.

DATA PROTECTION
Personal data is gathered in accordance with the Data Protection Act 1998. Your details may be passed to other companies who wish to communicate with you offers related to your business activities. Please tick the box below where appropriate:

☐ Please do not pass my information to any third party.

☐ I wish to receive email notification of future RINA events or publications

If you have any questions regarding this or any other RINA event please contact, Laura Whelan, Conference Organiser, on:

Tel: +44 (0)20 7201 2401 Fax: +44 (0)20 7259 5912
E-Mail: lwhelan@rina.org.uk www.rina.org.uk/events