



UKERC

UKERC MARINE NETWORK MEETING

Meeting Report, 14th April 2005

THE UK ENERGY RESEARCH CENTRE

The UK Energy Research Centre's (UKERC) mission is to be the UK's pre-eminent centre of research, and source of authoritative information and leadership, on sustainable energy systems.

UKERC undertakes world-class research addressing the whole-systems aspects of energy supply and use while developing and maintaining the means to enable cohesive research in energy.

To achieve this we are establishing a comprehensive database of energy research, development and demonstration competences in the UK. We will also act as the portal for the UK energy research community to and from both UK stakeholders and the international energy research community.

Future Sources of Energy (FSE)

Future Sources of Energy is a research and networking theme within UKERC. Activity focuses on a number of supply technologies which have yet to achieve commercialisation. Within these a range of issues are addressed, including technical development, appropriate policies and institutions for supporting innovation, and wider issues of social and community engagement. To avoid duplicating research and development funded by other public and private sector programmes, much of FSE's efforts are on co-ordination and networking rather than original research.

Output from Discussions at the Workshop

DTI – Ove Arup Report, 2000

- Main conclusions:
 - Wave Energy Industry is not co-ordinated
 - Technology used in Offshore and other industries can be transferred to the Wave Energy Industry
 - There are areas where generic R&D would be useful.
 - Lack of investor confidence in the industry
 - Issues common to both offshore wind and marine

New/other investment; Should not attack offshore wind as can benefit from it; investor confidence is important; short termism is a damper

DTI- Ove Arup Key Issues

Regulatory Environment, HSE, Design Codes & Verification

- No generic R&D needs were identified- **Disagree**
- Planning and Approvals Process should benefit from work carried out for Offshore wind.- *Not being addressed, technology and project developers do not know what planning process is required for marine energy; should make use of gains made by offshore wind in this area*
- Design & Verification Processes of the Offshore Oil & Gas industries can be transferred.- *don't know how to measure resource accurately, so how can you verify the designs; principles transfer, but verification needs a better understanding of the devices;*

Manned/unmanned devices should have differing standards; shoreline(coastal) vs offshore standards; DnV working on design guidelines as part of MEC; an example of an unknown is the fatigue of welds; process is reasonable but R&D is still necessary; need a planning process comparable to wind; HSE...

DTI- Ove Arup Key Issues

Construction Methods & Project Cost Estimation

- Transfer costing information and methods from Offshore Oil & Gas, and onshore civils and manufacturing industries. – *Tom Thorpe's ETSU costing spreadsheet is very good; Halcrow cost basis*
- Prepare a full list of industrial parties who would be interested in being involved in the Marine industry – *UKCMRE can contribute to this*
- A study of fabrication and installation guidelines is required so that the marine industry can benefit from production line philosophy. – *does not exist as a single database; Kays guide used for mechanical engineering; need agreed costs for all different operations, welds, moorings etc; need an almanac of manufacturing costs; John C. says this is available. The input is more important than how you would do it*

Market led development will help the investors decide;

DTI - Ove Arup Key Issues

Marine Operations

- No generic R&D needs as each device will have different requirements - *disagree; a special purpose installation vehicle is required that does not rely on the offshore industry and is cheaper*
- Device developers should work with installation contractors to satisfy their own needs
- Offshore operators can supply metocean data for tows and provide data for installation windows – *data available is patchy and not nearly available as suggested; costs of access: seabed/floating very different; offshore operators not familiar with coastal environment*

DTI - Ove Arup Key Issues

Mooring Systems

- Potential for technology transfer from the offshore industry, with particular reference to synthetic ropes and taut moorings - *material science may be transferable; blue skies research not required; scale probably prohibits the transfer design data and guidelines;*
- Generic studies: long term fatigue issues of lines and connection points, standard connector designs for mooring attachments and subsea cables
- Mooring studies required for the leading prototypes being developed
- Software development to predict the motion of arrays of devices in a given sea-state

Need to bear in mind that will probably require kms of mooring ropes in a marine farm. Hence accurate and verified designs are important

DTI - Ove Arup Key Issues

Operations & Maintenance

- No generic research needs as operational strategies will be device dependant - *devices can be classified in terms of coastline, floating or seabed – hence there is some possibility for generic research. Not entirely device specific*
- Potential for technology transfer from the Offshore Industry
- Use data on inspection and operation procedures presently used by the offshore industry for the monitoring of subsea or unmanned floating or fixed facilities

DTI - Ove Arup Key Issues

Materials

- A wide range of materials are currently used in the offshore environment, and hence no new materials need be developed in isolation for marine renewables - *disagree with this; the key for renewables is cost*
- Main issues: corrosion strategy, life cycle analysis, reliability of materials, erosion damage
- Technology transfer from the offshore oil and gas industry. - *cost will be out of scale*
- No generic research required - *disagree*

DTI - Ove Arup Key Issues

Hydraulic systems

- Investigate using water as the hydraulic fluid.
- Dynamic seals development and testing
- Better hydraulic machines with high part load efficiencies.
- Technology transfer from other industries to facilitate prototype development
- Work required to improve reliability and economic returns for commercial systems

Part load efficiency is important; need to improve this

DTI - Ove Arup Key Issues

Pneumatic Systems

- Applicable to OWCs, which are considered to be mature
- Work required to compare different turbines, in particular their efficiency
- Novel materials from the aerospace industry could be used for design and fabrication. - *lightweight materials provide low inertia, which is important for high speed control; fast algorithms to monitor flows; titanium is coming down in cost*
- Resistance to aggressive environments, value engineering, long maintenance life require further investigation. - *75% of the cost in the collector structure; require 50% savings; 25% reduction in lead times*

Fundamental maths of waves and collection chambers; modelling tools of collector geometries; need reciprocating air test facilities; PROVERBS network produced some good results (ask TOM BRUCE)

DTI - Ove Arup Key Issues

Subsea Cables & Connectors

- The only generic R&D project of value for the Marine Energy Industry as a whole. – *A GENERIC R&D, not the only*
- Development of a standardised, flexible connector is required
- Potential for technology transfer from both static and dynamic connectors from the offshore oil and gas industry

Major hot topic; lots of interest; Alcohol could be used; Wavehub

DTI - Ove Arup Key Issues

Control Systems

- Requires accurate models of specific devices
- Modelling and forecasting the wave input on a real time basis needs to be addressed
- Facility to remotely reconfigure a wave energy device would be very useful
-agree with this, and it is possible with existing IT technology
- Potential for technology transfer from areas of system control, remote control and monitoring from the offshore oil and gas industry

DTI - Ove Arup Key Issues

Power Quality and Grid Connection

- Grid map is required for the west coast of the UK
- Study of grid capacity required to recommend areas of upgrading.
- Testing and development of power conditioning modules for use in marine systems. - *power electronics*
- Energy storage during downtime
- Remote condition monitoring of devices and intervention strategies should be developed
- Investigation into potential for fault detection and the effective intervention strategies in grids

AC or HVDC transmission; energy storage is an important issue in its own right, but need to decide on the time required; timescales and economics; can learn a lot from power networks on ships;