iii.ii. Downloads and Resources

iii.ii.i. Manuals/Text books

A downloadable electronic version of this textbook is available at the AquaRET website (www.aquaret.com)

iii.ii.ii. Posters

A downloadable electronic version of the technology posters is available at the AquaRET website (www.aquaret.com)

iii.ii.iii. Expected learning outcome charts

Expected learning outcome charts are included in the test you knowledge section (Section X.9) for each of the technologies/

iii.ii.iv. Teacher/other guides

The document on the following pages contains a guide for educational professionals on how AquaRET resources might be used. It is also available as a download from the AquaRET website (www.aquaret.com)

iii.ii.v. Download Images and Illustrations

Downloadable electronic versions of the images and animations are available at the AquaRET website (www.aquaret.com)

iii.ii.vi. Where to get CD-ROM etc.

Contact your nearest project partner on how to receive a copy of the website on CD-ROM for working off-line. See section iv (following pages) for project partners.

iii.ii.iv. AquaRET Learning Materials - The Educational Potential

1. Introduction

Renewable energy, and in particular aquatic renewable energy, is a rapidly evolving sector. This is, however, no ordinary industry. Renewable energy technologies represent an important part of the solution to global warming, itself arguably the greatest challenge that has ever faced humanity. Renewable energy technologies also offer economic possibilities. The credit-crunch and what now looks like recession may present the opportunity for the transformation of our energy systems and the emergence of carbon-free economies powered by renewable energy technologies.

It is fair to say that there is an increasing general awareness of the need for renewable energy. However levels of technology-specific knowledge among the public at large, the media and even some key decision makers is remarkably low. It is still common to find headline articles in national newspapers confusing wave and tidal technologies and making fundamental errors in the reporting of basic facts and scientific principles. Politicians give verbal support to the sector but many of them lack even rudimentary knowledge of the state of technological development, the timescales involved and the levels investment required.

Aquatic renewable energy technologies offer tremendous economic opportunity. However the development of these technologies is not simple, with many important technical hurdles still to be overcome. Like all other industrial activities there will be impacts associated with development. Once fully commercialised the industry will occupy substantial sea areas and may displace traditional sea users. Marine renewable energy has the potential to help address climate change but it may itself have unanticipated impacts on the environment.

If these opportunities are to be realised, and these challenges are to be resolved, decisions need to be made. Choices need to be taken with respect to which technologies to develop, how they will be financed, where they will be located, as well as how they will be installed and maintained. These are significant decisions that require public debate and this debate needs to be made from an informed position.

The aim of Aqua-RET is to help start the process of educating the public at large, marine stakeholders, and the media and decision makers about aquatic and marine renewable energy. Aqua-RET intended to provide objective, up to date and freely available educational material about aquatic renewable technologies. The material is targeted at a range of audiences and delivered in variety of formats.

This short report will examine some of the educational possibilities offered by Aqua-RET. Anticipating some of the possible uses of Aqua-RET material will help the project team target potential users. It is worth noting however that the free web access to Aqua-RET will result in unforeseen and unanticipated uses of this material.

2. Primary Education

Primary education across Europe has undergone a transformation in recent decades. The development of core skills (e.g. numeracy, literacy) is still the principle function of the primary education sector. However children are now also encouraged to develop key learning and social skills (e.g. information retrieval and processing; group work). An important change has been the increased contextualisation of the learning process. Core skills are increasingly taught within a context, making use of case studies and examples in order to highlight their relevance and maintain learner interest.

Another change in the curriculum, notably in the UK, is the inclusion of environmental studies. While environmental issues are necessarily taught at a rudimentary level there is an effort to approach even basic environmental science from a systems perspective. The interrelationships between parts of the ecosystem, human activity and the environment are emphasised. Exploitation of fossil fuels and global warming are an obvious example of this approach. Renewable energy alternatives to fossil fuels, and consequently Aqua-RET, are clearly relevant in this context.

The Aqua-RET web text is delivered in three levels of increasing complexity. Even level 1 content is probably too sophisticated to be directly used as learning material for primary age children. The material will however provide a resource for primary school teachers developing class material.

Key uses

- Resource for teachers preparing class material particularly in the context of environmental studies.

3. Secondary Education

There are no common European standards for either curriculum content or delivery in secondary education. There are significantly different approaches to curriculum content delivery and assessment across Europe. However some generalisations are possible. Secondary education across Europe is typified by the processes of subject differentiation and streaming. Compared to primary education the curriculum is more clearly divided into academic disciplines. Teaching is delivered and assessed in discrete units. As students advance through secondary years they generally specialize in an increasingly smaller number of disciplines. The extent of these processes varies from country to country. Scotland and France for example have secondary education systems which allow a high level of subject choice compared to the English system, which emphasises greater depth of knowledge over a smaller range of subjects.

Aqua-RET material will have various applications in the context of secondary education; these include:

Key Uses

- Physics and engineering: these subjects at secondary school develop basic Newtonian physics. The principles of gravity, power, work and momentum can all be taught in the context of aquatic renewables. The basic principles of energy and the laws of thermodynamics can also be illustrated using renewable energy examples. Forms of energy (i.e. mechanical, electrical, potential and kinetic), energy transformation and storage are fundamentals of engineering and key to understanding aquatic renewables. Electricity and the relationship between the rated power of a device or machine and actual electricity generation and use can be easily illustrated. More advanced studies will examine waves, their constituent parts (e.g. wavelength, period, frequency) and interaction (e.g. refraction, attenuation).

- Geography and environmental studies: these disciplines develop students' understanding of basic environmental processes and human interactions with the environment (i.e. resource exploitation, pollution and ecosystem services). Basic environmental processes (e.g. water cycle, waves and tides) are discussed within the Aqua-RET materials. The distribution of aquatic energy resources is described in Aqua-RET and the link between these resources and basic earth processes (e.g. tides prevailing winds) is easily made. The complex pressure/state/response relationships – between fossil fuels (environmental pressure) global warning (state – spatially and temporally diffuse) and renewable energy (response - with its localised impacts) – is perfectly illustrated in Aqua-RET. There is further potential to explore planning issues and key characteristics of conventional power generating technologies which use concentrated (and transportable) fuels compared to renewable energies which rely on a diffuse energy flux and which are geographically constrained (i.e. the technology must be located where the energy flux exists in the environment).

- Language: Aqua-RET material could be used to develop language skills. Students could be challenged to prepare interpretive material (e.g. a newspaper article) which summarises Aqua-RET material. The material provides a balanced view of the state of the technology and potential environmental impacts. This makes it ideal source material for debates and topical studies.

- Foreign language: It is possible that Aqua-RET material could be used for more advanced foreign languages teaching.

4. Tertiary Education

Tertiary (post school) education covers a wide range of subjects taught at a variety of levels. Further education colleges deliver vocational training while universities delivery more academically orientated courses at undergraduate and postgraduate levels. The possibilities for Aqua-RET material are as varied as the courses themselves.

One increasingly common feature of tertiary provision is the use of distance and blended learning material. This frequently involves the use of web based learning materials often using proprietary e-learning environments such as WebCT or Blackboard. These tools are used by on-campus students as well as distance learners.

A common failing of online delivery is simply to use e-learning environments as a repository for conventional text based notes. This fails to exploit the full learning potential of these new media. Animation is one of the interesting possibilities presented by online learning however good animation and high quality diagrams are time consuming and expensive to create. The Aqua-RET animation will be quickly adopted by tutors developing e-learning material. Because Aqua-RET material is web based it will be easy to direct students to it using hypertext links.

Key Uses

- Physics and engineering: the uses of Aqua-RET material may be less than expected in this context, when compared to secondary education. In terms of core competencies, physics and engineering students on specialist degree courses will quickly go beyond the level explained in the Aqua-RET material. However the material will be useful for putting core knowledge in context.

- Environmental studies, planning: Aqua-RET material has potential to become an important resource for students on environmental studies courses and their tutors. Complex relationships between fossil fuels and climate a change on one hand and renewable energy and stakeholder conflicts can be explored in depth with the aid of Aqua-RET. Planning conflicts and compromises can be illustrated with this material (e.g. conflicts between national renewable energy targets, regional policy and EU conservation objectives). Students of marine planning can examine the impact of closed areas on marine users and consider the legal implications of this development (e.g. navigation, fisheries, Marpol, Osparcom).

- Students studying applied aspects of environmental studies, in particular environmental risk assessment (ERA), environmental impact assessment (EIA) and strategic environmental assessment (SEA), will be able to draw on Aqua-RET material. The Environmental Interaction Matrices that have been produced are good exemplars of the Leopold matrices routinely used as the basis of commercial EIA studies. Students could easily take these and develop impact scales and complete a rudimentary EIA.

- Energy studies: Obviously Aqua-RET material is highly relevant to modules and courses in energy studies. In Aqua-RET students have a single source which gives and accurate and balanced overview of five technologies providing a building block for further investigation.
- Economics, environmental economics, politics, and economic geography: the distribution of energy resources is a key determinant of geopolitical and economic power. Conventional energy resources and their distribution are key to understanding the economics and politics of the 20th century. As peak oil is passed and tackling climate change becomes an imperative, the distribution of renewable energy resources will shape economic the economic and political landscape as we advance through the 21st century. Renewable energy also provides a useful vehicle to explore issues such as externalities, public goods and the role of economic instruments (taxes tradable permits etc). The role of state versus state-supported private sector in the delivery of renewable energy, and energy in general, is an important debate for students of politics and economics.
- Modern languages: Aqua-RET could provide a useful source of technical material at different levels of difficulty for interpretation.

5. Continuing Professional Development

Continuing Professional Development (CPD) is training targeted at individuals in the workplace. CPD is generally intended to ensure that knowledge and skills are kept up to date. Initially CPD requirements were introduced by professional associations in order to ensure that affiliates stayed abreast of technological and legal developments in their specific professional fields. Many professional associations (e.g. RICS, RIBA) compel their members to undertake a minimum number of hours of CPD each year. The principle of CPD has spread and most companies now recognise that CPD is important not only for maintaining the competence of staff but also maintaining staff motivation. Increasingly employees expect and value training. Indeed the notion of CPD has extended to the level of individuals. In competitive labour markets many individuals voluntarily seek opportunities for CPD in order to enhance their employment and prospects.

CPD training materials are characterised by a number of features:

- It should be deliverable in discrete self-contained packages.
- It may need to be accessible to individuals from a variety of backgrounds.
- It may be useful to have the material available at different levels.
- The ability to be delivered flexibly either in the work place or at the convenience of the employee is advantageous.
- Material which is provided by recognised authorities or somehow accredited may be required.

- The ability to test trainees and verify competency is desirable in some situations.

Aqua-RET material either meets or has the potential to satisfy these objectives.

Key Users

- Aqua-RET material lends itself to CPD applications. The material would be relevant to members of a wide range of professional associations, particularly in the fields of mechanical engineering, electrical engineering, civil engineering, surveying, architecture, public administration etc.
- There may be an interest for Aqua-RET amongst employers. These may include the utilities, local government, regulators and large environmental and engineering consultancies.
- There is a market for CPD targeted at individuals and doubtless individuals will look at Aqua-RET material for their own interest and self improvement. However certification is often an important motivator for individuals. Third party testing and certification is an important future development that may be considered for Aqua-RET. Free access to the Aqua-RET material could still be maintained. Maintaining an assessment procedure would however incur a cost and therefore a charge would need to be levied if individuals wished to be assessed. The European Computer Driving Licence (ECDL) is good example of CPD together with third party testing and certification.

6. Aqua-RET as briefing material

The introduction to this short report noted the poor level of knowledge, about aquatic renewables, displayed by many decision makers and media commentators. The accurate reporting of fundamental principles and clear facts is essential if the quality of public debate is to be raised and good decision making facilitated.

It is clear that the full scale commercial development of aquatic renewable energy will require compromises and difficult decisions. Full scale wave energy may close large sea areas from other sea users, tidal barrages will have environmental impacts and tidal current development may impact on navigation routes. Society needs to decide how to deal with these impacts. This difficult process is made immeasurably harder when the public debate is polluted by inaccurate information.

Untruths and rumours already abound, including:

- false information - e.g. “it takes more energy to construct a wind turbine than it ever generates”
- sweeping statements - e.g. “tidal energy has no environmental impacts”
- technical inaccuracies - e.g. “... the windmill will generate 3MW of electricity”

Aqua-RET has the potential to become a trusted source of accurate and unbiased information. It could become a reference for politicians and their advisors, media commentators and researchers, so that they can access information about aquatic renewable energy and technologies.

Potential users

- Politicians and their researchers
- Regulators
- The media
- NGO’s
- Stakeholder groups
- Professional associations
- Think-tanks, and lobby groups

7. Conclusions and recommendations

This short report has identified potential users of the learning material produced by the Aqua-RET project. These potential uses are wide and varied. However, it is almost inevitably the case that when Aqua-RET is delivered new uses will emerge.

However, based on the preceding discussion, it is possible to identify some challenges and make a number of recommendations;

- The renewable energy sector is rapidly evolving. Wave and tidal current technologies are going through a phase of rapid technological development and our understanding of impacts on the environment and other sea users is embryonic. On one hand this creates a need for a resource like Aqua-RET. Equally it means that content will quickly date. A process for reviewing, and updating the content will be required in order to maintain the value of the project. Obsolescence is arguably the single largest threat the continued relevance of Aqua-RET.
- It would be worth working with primary and secondary teachers in individual countries to match Aqua-RET material with the curriculum and work up specific case studies and examples that could be extracted and applied in the classroom. At the moment there is a great deal of useful information contained within Aqua-RET but individual teachers would need to mine the available information in order to identify specific material relevant to their needs.
- It would be useful to develop quizzes and less formal material targeted at the youngest learners.
- Some form of test certification may increase the potential market for CPD. The European Computer Driving Licence may be a relevant model.
- Raising the initial profile of the material will be a challenge. One of the strengths of the material is the potentially broad audience. However this strength also makes informing the audience challenging. It may be useful to target professional associations, teachers' organisations/associations and teaching colleges to raise brand awareness. Strategies for maximising web hits will be vital. Once a critical level of use is reached, and a good reputation established, Aqua-RET's profile may become self sustaining.

iv. Consortium and Contacts

iv.i. Aqua TT UETP Limited, Ireland (consortium leader)

AquaTT, a non-profit making international foundation which is based in Dublin, Ireland is a European network for aquatic resources education, training and technology transfer. AquaTT was founded in 1992 under the EU COMETT programme as the University Enterprise Training Partnership (UETP) for the European aquaculture industry. The initial proposal arose from the identification of a clear need to systematise, coordinate and develop the training requirements of the industry through a single body.

Background

The organisation's strategic aim is, "To provide project management and training services to support the sustainable development of Europe's aquatic resources." The AquaTT network consists of universities, students, producers and industry members involved in the aquaculture sector, or related aquatic resource disciplines in Europe. AquaTT supports the aquaculture industry, and related aquatic resource sectors, through the provision of support services and through participation in, and coordination of EU projects and programmes in the areas of education, training and technology transfer.

AquaTT's mission is to bridge the knowledge gap between the dynamic R&D environments and the progressive commercial sector. Since its incorporation, AquaTT has successfully carried out EU projects in COMETT, PETRA, FORCE, LINGUA, Leonardo da Vinci, Quality of Life, and the Socrates Programmes.

Responsible person within Aqua-RET

David Murphy has worked at AquaTT since September 2000 becoming Manager in January 2001. As manager he is responsible for all aspects of running the company; office management, finances, project management, liaising with partners and network members, reporting and company development.

For more information about AquaTT visit http://www.aquatt.ie.

iv.ii. Aquatera Ltd, Orkney, UK

aquatera.co.uk
environmental services and products

Aquatera was established in 2000 and is based in the islands of Orkney, which lie off northern Scotland. One of Aquatera's key missions is to improve the quality of information available to government, industry and the public on environmental and sustainability issues.

Background

Aquatera's aim is to "Promote rational use of resources, protection of the environment and sustainable communities through provision of information, services and technology to industry, government, other agencies and the public." The marine renewable industry has provided a key focus of activity over the last few years and Aquatera has established itself as one of the leading consultants in this area.

Aquatera undertakes four types of activity:

- Adding value to environmental information
- Provision of environmental advice
- Producing environmental awareness material
- Developing improved environmental management tools and technologies

These activities are organised into six core theme areas:

- Online services - Providing environmental information services and products through e-commerce and digital communications technology
- Consultancy solutions - Expert and result orientated environmental and technical consultancy services
- Design of materials - Development and production of environmental awareness materials, good and gifts
- Technology development - Development of improved environmental management tools
- Communication - Facilitating environment related communication, training and education initiatives
- Executive services - Senior management and boardroom services related to environment and reputation

Responsible person within Aqua-RET

Dr Gareth Davies has worked as an environmental consultant for 20 years. He trained initially as a marine biologist completing a PhD in Deep Sea Biology. He has since completed over 350 projects covering a wide range of environmental and operational topics. He is renowned for innovative thinking, unbounded enthusiasm and commitment to finding solutions. Gareth has worked in many areas of the world including Sakhalin, Caspian, Mediterranean, South America and many island groups.

iv.iii. Centre for Renewable Energy Sources (CRES), Greece

The Centre for Renewable Energy Sources (CRES) is the Greek national centre for Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES). CRES was founded as the national co-ordination centre in its area of activity by Law 2244/94 (Production of Electricity from renewable Energy Sources) and Law 2702/99.

Background

CRES was founded in 1987 and is a public entity supervised by the Ministry of Development, with financial and administrative independence. The Centre has a scientific staff of more than 120 highly experienced and specialised scientists. Its main goal is the promotion of RES/RUE/ES applications at a national and international level, as well as the support of related activities taking into consideration the environmental impacts in the production and use of energy.

In order to achieve its goals with regard to RES/RUE/ES technologies and applications, CRES:

- is the official Greek government consultant on issues of RES/RUE/ES national policy, strategy and planning;
- carries out research and develops techno-economically viable and environmentally friendly technologies;
- organises, supervises and implements demonstration and pilot projects, to promote the above technologies;
- disseminates technology in its areas of expertise and provides support, technical services and advice, in the form of specialised know how and information, to third parties.

CRES organises and its experts participate in scientific events, specialised training courses and workshops held both in and outside Greece. In the course of its work, CRES has developed close collaborations with a large number of organisations and national projects.

Responsible person within Aqua-RET

Dr Char Malamatenios in the period 1989-1993 was a post-graduate researcher in the Laboratory of Thermal Turbomachines (LTT/NTUA), where he developed two-phase flow calculation methods for both the inviscid and viscous parts of internal aerodynamic flows applied in the turbomachinery field. In the period 1994-1996 he was a post-doctoral researcher in the LTT/NTUA, where he worked on Meridional Surface flow calculations in steam-turbine applications. Dr. Malamatenios joined CRES in 1997 (from November 1997 he became the head of CRES Training Department), where he looks on the implementation of programs related to the training in the RES and/or RUE issues of various professional. He also elaborates the training tools (CD-ROMs, Guides, Textbooks etc.) addressing the target groups.

For more information on Centre for Renewable Energy Sources visit http://www.cres.gr/kape/index.htm.

iv.iv. Cyprus Institute of Energy, Cyprus

The Cyprus Institute of Energy (CIE) was established in 2000 by the Minister of Commerce, Industry and Tourism as a non-governmental organisation in accordance with the provision of The Societies and Institution Law 1972 (57/1972).

Background

The main aim of the Institute is the promotion of renewable energy sources (wind, solar, biomass, geothermal or any other form of renewable energy which is known or will be of interest in the future for Cyprus), rational use of energy, promotion of energy conservation and any other form of activities which contribute to the promotion of the above sectors aiming to widen the utilisation of economically viable energy technologies.

In order to implement its aims, the Cyprus Institute of Energy is involved in relevant international programmes, co-operates with similar international institutions, uses consultants or specialised scientists (local or international experts) when the need arises, provides technical aid and information and is active in the field of information and promotion of new innovative energy technologies in particular the utilisation of Renewable Energy Sources (RES). CIE currently employs 16 people, 7 of which are engineers in their field.

For more information on the Cyprus Institute of Energy visit http://www.cie.org.cy.

iv.v. La Tene Maps, Ireland

La Tene Maps is a knowledge driven geoinformatics company primarily producing and supplying thematic maps and posters. The company works mainly on areas of the marine and natural resource sectors including Aquaculture, Fisheries, Oil and Gas Exploration, Renewable Energy, Power Generation, Marine Environment and Leisure Subjects.

Background

Established in 1986 La Tene Maps mainly produces maps, educational posters, directories and websites and have been working in the Renewables area since the 1990s. The company is the world leader in the production of maps on Wind Farming and Marine Renewables. La Tene Maps has been involved in EU research projects having elements of innovation and technology transfer in them as well as concentrating on informational website and educational material. The company participates in research projects for Government departments, state bodies and private companies. The company is also involved in production of confidential maps and graphics for clients and also sells a small range of maps and posters produced by itself and other companies online.

Responsible Person within Aqua-RET

John Coleman was educated at University College Dublin, Ireland and the University of Glasgow, Scotland. John is a qualified Geographer, Archaeologist, Secondary School Teacher and Cartographer. He has spent the last twenty years making maps, educational and informational posters.

As the Chief Executive of La Tene Maps he has developed a company specialising in mapping rapidly changing industry sectors and has been the first to produce activity maps on various sectors including Wind Farming and Marine Renewable sectors such as Wave and Tidal Stream activities.

iv.vi. Scottish Renewables Forum Ltd, Scotland, UK

Scottish Renewables has presented a united voice for the renewable energy industry in Scotland since 1996. Scottish Renewables is a forum of key players with interests including biomass, hydro, micro, marine and wind technologies. Members share a common interest in the development of renewables in Scotland.

Background

Scottish Renewables aim is to support the development and provision of a sustainable energy future for Scotland. Sustainable energy comes from sources that are safe, clean and renewable, and which should also be secure, diverse and competitive. Scottish Renewables therefore promotes the effective use of Scotland 's abundant wind, wave, hydro, biomass, solar, landfill gas, tidal and geothermal resources to generate social, economic and environmental benefits for all. Scottish Renewables undertakes a range of functions - organising regular meetings of members, running events such as the Scottish Green Energy Awards, and providing briefing services and industry intelligence to members and key groups.

The objectives of Scottish Renewables are to:

- Promote a vision of the "win-win" potential of renewables to create jobs and prosperity for Scotland, as well as safeguarding the environment, to encourage the adoption of targets and strategies which make the best use of our indigenous resources
- Work with Government organisations, NGOs and other interested parties to formulate effective strategies, deliver agreed targets, and integrate renewables into the broader agenda for sustainable development in Scotland
- Facilitate networking for constructive dialogue between Members and Associates and other stakeholders through extensive events programme
- Provide coherent, unified and authoritative representation of Members' interests at the highest levels through meetings, briefings and responses to formal consultations
- Research, collate and disseminate information about renewables and business opportunities to serve the needs of Members and Associates
- Provide professional and expert intelligence to Members through daily briefings, specialist working groups and monthly newsletter

Responsible persons within Aqua-RET

Morna Cannon has been with Scottish Renewables for a year and a half, after graduating from Cambridge University in 2007 with a BA Hons (1st Class) in Land Economy. As Marine Development Officer, she focuses on policy development and member services relating to marine energy. Over the last year, she has represented the marine energy industry in a number of fora, including the Sustainable Seas Task Force and the Nautical and Offshore Renewable Liaison Group. She is currently seconded to the Scottish Government 4 days a week, working on marine energy policy issues.

Calum McCallum has worked with Scottish Renewables for just over four years developing events and initiatives to promote the organisation and renewables in Scotland and the UK. He has a background in events ranging from running venues to organising large-scale events. Previously he was involved in co-ordinating Objective 3 projects establishing on-line vocational qualifications for the events industry and was instrumental in creating a platform to build a pan European industry recognised qualification.

For more information on Scottish Renewable visit http://www.scottishrenewables.com/.

iv.vii. University Politehnica of Bucharest, Romania

The Department of Hydraulics and Hydraulic Machines (HMH) within University Politehnica, Bucharest (UPB) was established in 1920. The HMH Department trains specialists in the field of Hydro-Power Engineering, Environmental Engineering within the Faculty of Power Engineering and in the field of Hydraulic and Pneumatic Machines within the Faculty of Mechanical Engineering.

Background

The Department of Hydraulics and Hydraulic Machines is a separate body which depends from an administrative point of view on the Faculty of Power Engineering. Each year, the teaching staff of the HMH Department provides background Fluid Mechanics education for the students of the six faculties within the UPB having a Mechanical or Electrical profile. UPB has many research projects regarding renewable energy resources, small hydropower potential, wind energy and biomass.

The main research areas in the HMH Department are: optimisation in isolated and cascade hydroelectric power plants, numerical modelling of thermal pollution, complex management of lakes for power production, water supply and agriculture use, renewable energy resources, recovery and use of industrial waste, waste water cleaning, air cleaning and conditioning, theoretical and experimental studies of the dynamics of mechanical and electro-hydraulic servomechanisms, theoretical and experimental studies of energetic processes, information processes of power engineering installations.

Responsible person within Aqua-RET

Dr. Carmen Anca Safta graduated in 1986 with a MSc. in Mechanical Engineering and in 1998 with a Ph.D. in Hydraulics and Hydraulic Machineries from the University of Politehnica of Bucharest. Dr. Safta has held successive academic positions at the University Politehnica since 1992 and is currently Assistant Professor of Hydraulic Machines and Hydraulic Equipment used in Hydropower Engineering in the Department of Power Engineering Faculty. She is a member of the organising committee of the Hydraulic and Hydraulic machineries Department since 2004, the Romanian Association of Mathematics Applied in Industry, ROMAI, since 1996 and the Romanian experts of the National Council of Scientific Research in Universities (CNCSIS), since 2004. Dr. Safta has acted as the lead organiser of the National Conference of Romanian Hydro Engineers, 2000, 2002, 2004 editions and has had scientific exposures at the National Yokohama University, Japan, 2004. She has also been involved in TEMPUS grants; ECOLEX, Fachhochschule Bochum, Department of Economics, 2002, Free University of Brussels, Belgia, 1999 and Universitatea din Sunderland, Anglia 1995.

For more information on the Department of Hydraulics and Hydraulic Machines (HHM), University Politehnica, Bucharest (UPB) visit http://www.hydrop.pub.ro/.

iv.viii. Wave Energy Centre, Portugal

The Wave Energy Centre (WEC) is a non-profit organisation founded in 2003. The WEC is dedicated to the development and promotion of Ocean Wave Energy utilisation through technical and strategic support to companies, R&D institutions and public entities.

Background

The aim of the Centre is to promote collaboration between companies, research centres and developing teams in view of the development, promotion and marketing of wave energy devices. Among the activities of the WEC, the Centre trains scientists and technicians and promotes the access of researchers to associated test infrastructures. The WEC strives to collaborate with companies and other institutions outside Portugal that recognise the necessity of International Cooperation, in particular those who seek an association with Portuguese companies. The WEC renders services to entities that intend to explore the attractive natural and legal conditions of Portugal for testing and demonstration of wave energy structures. The Centre also undertakes R&D projects to support the development of wave energy on national and international level: Pico Plant, CA-OE, Wavetrain among others.

Responsible person within Aqua-RET

Frank Neumann graduated in 1999 as a Civil Engineer and has been involved in Wave Energy projects and research since then. He contributed significantly towards the founding of the Wave Energy Centre (WEC), which he joined as project manager in 2004. Since 2008 he is Deputy Director, being responsible for the day-to-day management of WavEC, project development, engineering and technological services, and dissemination. He has gathered substantial field experience by monitoring the AWS (2004) and Pico (2005-2007) wave power plants. He has further co-initiated and managed the Marie Curie RTN (Research Training Network) Wavetrain under FP6, and the new PEOPLE ITN (Initial Training Network) Wavetrain2 under FP7.

For more information on the Wave Energy Centre visit http://www.wave-energy-centre.org/.