
The ORECCA project is a European Union (EU) Seventh Framework Programme (FP7) funded collaborative project in the offshore renewable energy sector. The project’s principal aim is to overcome the fragmentation of know how available in Europe and its transfer amongst research organisations, industry stakeholders and policy makers stimulating these communities to take the necessary steps to foster the development of the offshore renewable energy sector in an environmentally sustainable way. The project brings together a combination of world class experts from a wide variety of multinational companies, research institutions, consultancies, utilities and project developers. The project's focus is pan European and pan technology, with a specific focus on the opportunities that exist across Europe when the three offshore renewable energy sectors within the project’s scope are considered together. Within the ORECCA project, the scope of the offshore renewable energy sector (‘offshore renewables’) was confined to:
- offshore wind;
- wave energy; and
- tidal stream.
These energy sectors have been identified as those that are currently expected to make significant contributions to the energy system in the medium to long term. As a result, other sectors, such as tidal barrage and ocean thermal energy conversion (OTEC) were not covered in the scope of the project.

The results in the form of reports delivered and data made available are structured around the five key streams below which
are essential to the development of the offshore renewable energy sector:
- resource;
- finance;
- technology;
- infrastructure;
- environment, regulation and legislation.

The results for the five key streams are published in nine topical reports available for download on the document section of the website.

One main objective of ORECCA has been to develop roadmap studies for the research, deployment and regulatory activities in this field. This roadmap aims at defining the strategic priorities, including socio economic aspects, for the development of offshore renewable energy conversion platforms in the context of an integrated European maritime policy:
- to identify synergies;
- to overcome barriers to the development of the sector;
- to realise the large opportunities presented by the sector;
- to facilitate significant, cost effective commercial scale deployments by 2030;
- to do all of this in an environmentally sustainable way.

Two expert workshops were held during the project more than 100 invited experts:
Workshop 1: The future of offshore renewables
Workshop 2: Outlining the vision for future renewable energy conversion platforms in Europe.
The outcome and discussion of these events are summarised in two workshop readers.

ORECCA provides several databases online including a WEBGIS covering resource information across Europe including information such as EEZs, bathymetry, wind speed, wave power, tidal stream sites, exclusion zones, distance to shore, ports, installed RE projects and pipeline.

Project context and objectives:

The worldwide trend of the wind sector is steadily improving with nearly 60 % of the total wind power capacity installed in Europe. The global wind power capacity increased from 32 MW in 2003 to 94 GW in 2007. During the same period, the average growth rate was 19 %, ranging from additional 8,3 GW in 2003 to 19,5 GW in 2007 with respect to the previous year. However, with the expanding demand for renewable energy there is a need for larger wind farms located in regions of high wind resource, which has prompted a move towards increased emphasis on harnessing offshore wind resources.

Offshore wind parks in Europe today account only for 2.5 GW of the total installed wind power (approximately 2 %) and are located at shallow depths up to 20-30 m. Current offshore wind technology entails constructions of foundations on which the wind turbine is erected. The basic three configurations are: mono-pile consisting of a steel pile which is driven approximately 10 to 20 m into the seabed, gravity foundation consisting of a large base constructed from either concrete or steel which rests on the seabed (currently used on most offshore wind projects) and tripod or jacket foundations used at deeper depths (only in few projects so far). The economics of such designs limit the development of offshore sites to 5-30 m in depth, with the cost of the substructure dramatically growing with deeper water depths.

Moving offshore presents particular challenges to the wind energy industry but also many advantages. The higher wind resources at offshore sites and greater persistence of winds in power generating classes, coupled with avoidance of many land use conflicts, means that offshore wind is set to develop in a significant way, and the potential offshore market is the main driver for large turbine technology development. However, there are major drawbacks and restrictions mainly due to the limited availability of shallow waters and the criticism of stakeholders about the social and environmental impacts at the construction sites. One of the major issues is the visual impact from the coast.

Similar benefits apply to the ocean energy sector. Deep offshore sites, which require floating or fully submerged structures,
offer far better wave energy resources and cause no visual intrusion. However, many first generation technologies have been designed for shoreline or near shore installations, where devices can be installed in shallow water or at the shore but wave power has dropped significantly.

In contrast to the wind energy sector, present wave energy technology shows a wide variety of systems, at different stages of development, competing against each other. The main concepts under development are oscillating body systems, floating OWCs and overtopping devices.

The development from the concept to the commercial stage is a difficult, time consuming and expensive process. The final stage of the development is testing under real sea conditions. In most systems, optimal wave energy absorption involves resonance, which requires that geometry, mass and size of the structure match wavelength and/or wave period. So, pilot plants tested in the open ocean must be full-sized structures, which is often in the MW range. Consequently, it is difficult to follow what was done in the wind turbine industry in scaling machine size slowly to the MW size we are at today. The high costs of constructing, deploying, maintaining and testing large prototypes, under sometimes very harsh environmental conditions, has hindered the development of wave energy systems, in most cases possible only with substantial public support. At the present stage of technological development and for the systems that are closer to commercial stage, it is widely acknowledged that the costs are about three times larger than those of energy generated from the onshore wind. It is therefore not surprising that the deployment of full-sized prototypes under open ocean conditions has been taking place in coastal areas of countries where specially generous feed-in tariffs are in force, and/or where government supported infrastructures (especially cable connections) are available for testing. This approach is applied e.g. in the United Kingdom (UK) in the context of the Wavehub and in the Portuguese pilot zone.

Today, these initiatives are limited to one technology only; there is no combined wind wave pilot zone yet. It is therefore the concept of this proposal to combine resource information from wind and other ocean energy sectors - in particular wave energy, review and benchmark existing technologies in the oil and gas sector, the offshore wind sector and the wave and tidal energy sector in order to identify siting synergies with respect to shared areas and grid connection etc. and technological synergies with respect to structural integration of e.g. a wave energy device into a fixed or floating wind turbine.

A common approach for the exploitation of wind, wave and other ocean energy resources has the potential to accelerate the offshore market development and to reduce the overall cost for the energetic exploitation of the oceans and seas.

Moving offshore to the wide unused spaces of the deep-water marine environment, at distances where visual intrusion and marine environmental impact of energy farms would be minimal i.e. larger that 20 km, would also give the scope for the integrated development of different commercial renewable energy such as wind, ocean current and wave energy and eventually tidal in places where tidal flows could be channelled, i.e. the Pentland Firth.

A common road map for the whole OE sector with particular emphasis on offshore renewable energy conversion platforms was to be developed based on existing work for the different sectors by experts from all relevant fields. The project therefore focussed on establishing the state of research, technological development and demonstration activities on offshore renewable energy conversion platforms and on the definition of strategic priorities, including socio economics aspects, for the development of offshore renewable energy conversion (OREC) technologies and markets.

ORECCA aims to overcome fragmentation of the know how available in Europe and its transfer amongst research organisations, stakeholders, and policy makers stimulating these communities to take the necessary steps to foster the development of the ocean energy sector in a sustainable and environmentally friendly way.

The goals of the ORECCA project are to create a framework for knowledge sharing and to develop a roadmap for research activities in the context of offshore renewable energy that are a relatively new and challenging field of interest. In particular, the project stimulates collaboration in research activities leading towards innovative, cost efficient and environmentally benign offshore renewable energy conversion platforms for wind, wave and other ocean energy resources, for their combined use as well as for the complementary use such as aquaculture, e.g. biomass and fishes, and monitoring of the sea environment, e.g. marine mammals, fish and bird life.
The project activities favour the spread of knowledge by focusing on three groups of stakeholders, G1: industrial investors and technology providers, G2: research organisation and technology developers and G3: (research) policy makers including the EC.

The technological state of the art, and the existing economical and legislative framework are reported and barriers, constraints and needs are identified. ORECCA nurtures an environment for collaboration among stakeholders and contributes to define the framework for future exploitation of offshore renewable energy. ORECCA finally develops a common enlarged vision including different technical options for deployment of offshore energy conversion platforms for three different target areas in the oceans and seas around Europe and delivers integrated roadmap documents addressing the stakeholder groups. These contain the definition of the strategic investment opportunities, the R&D priorities and the regulatory and socio-economics aspects that need to be addressed in the short to the medium time to achieve a vision and a strategy for a European policy towards the development of the offshore renewable energy (RE) sector.

The objectives of the ORECCA project are:
- to improve the information exchange and promotion of specific research cooperation in this field between academia and industry, public and private actors;
- to create an efficient and focused framework for knowledge sharing;
- to involve and stimulate the relevant stakeholder groups in Europe to define the framework for future exploitation of renewable energy sources in the offshore;
- to develop roadmap studies for the research, deployment and regulatory activities in the field of offshore renewable energy.

To achieve the project objectives, the project focused on:
- mapping available renewable energy sources in three European target areas (area 1: North and Baltic Sea, area 2: Atlantic Ocean, area 3: Mediterranean and Black Sea);
- establishing the state of the art of research and technology available for renewable energy conversion platforms;
- monitoring current research activities and demonstration projects worldwide on offshore renewable energy conversion platforms;
- liaising with international organisations such as IEA and IEC and involve international experts from the United States (US), Canada and from international target countries such as Australia and New Zealand, Japan, South Korea and Chile;
- organising initiatives such as meetings, seminars, workshops, brainstorming sessions and studies on the topic ‘offshore renewable energy conversion platforms’;
- disseminating knowledge and results of ongoing research and demonstration project and encourage exchange of best practices among the relevant involved actors in the field through creation of a dynamic, neutral and open forum;
- stimulating industrial and academic groups toward a joint cooperation for research on use of offshore areas for multiple conversion of at least two renewable energy sources and on models for complementary purposes such as aquaculture and environmental monitoring;
- defining the strategic priorities, including socio economics aspects, for the development of offshore renewable energy conversion platform in the context of an integrated European maritime policy.

The consortium covers not only the manufacturing and installation process for offshore RE platforms by large industries and end-user small and medium-sized enterprises (SMEs), but also the spectrum from theoretical background of researchers for the modelling, design and evaluation to practical experiences from installations and testing of offshore renewable energy technologies in the offshore wind as well as the ocean energy sector of wave and tidal devices. In particular, the fragmented and scattered experiences from a limited number of ocean energy and deep-offshore wind installations are collected, analysed and reflected in the strategies to be developed.

Key members of the consortium are actively involved in a number of other R&D activities and networks and will create a strong link to bring together the existing know-how in the different sectors. Consortium members are e.g.:
- involved in a number of previous and ongoing related research activities: POW’WOW, CA Ocean Energy, UK SuperGen Marine Consortium, Waveplam and EU EquiMar programme;
- R&D networks such as the European Wind Energy Academy, European Technology Platform Wind (TPWind), DERlab;
ORECCA brings together a unique combination of world class researchers and technology experts and provides an efficient and focused collaborative working environment.

Project results:

All results of the ORECCA project have been put into the reports published on the website. The main results and recommendations have been implemented into the roadmap documents. The executive summary provides the main results of the project. It is important to point out, that due to the nature of the project being a CSA-type only secondary research has been executed. Therefore, all results generated within the project are summarised in the roadmap. In order to avoid any confusion with producing another document describing the results, the roadmap exec summary is considered to be the document covering the reporting requirements with regard to this section of the final report.

Potential impact:

Due to the coordination and network nature of the ORECCA, the spread of excellence, exploitation of results and dissemination of knowledge are some of the main objectives of the entire project. The key elements are:
- spreading excellence is realised through the ORECCA consortium itself as described above. In total, around 100 researchers and technology experts are involved in the project itself, providing complementary skills and backgrounds. Besides the ORECCA partners, expertise from outside the consortium is involved through the workshops and the website. Some international experts were invited by ORECCA to participate in the workshops, were needed travel budgets were made available.

Cooperation and liaisons has been established with:
- a number of previous and ongoing related national and European research activities;
- R&D networks and technology platforms such as TPWind;
- international organisations such as IEA (wind and ocean) and IEC TCs (wind and ocean).

The entire WP 6 is dedicated to the dissemination of results within and outside the consortium. Key elements are:
- the extensive use of the internet as the main communication channel by establishing a web portal;
- the two two-day workshops;
- the contribution to a number of relevant conferences through papers and presentations in the sectors of wind, wave and tidal;
- the involvement of stakeholders from outside the consortium.

In addition to the exploitation of results through the partners and stakeholders involved as described above, ORECCA has a collaboration with the Marina Platform project funded under topic ENERGY.2009.2.9.1: 'Deep offshore multi-purpose renewable energy conversion platforms for wind / ocean energy conversion'. The duration of ORECCA of only 18 month has been chosen to allow feeding the results into this project as well as into the future European research policy under the Seventh Framework Programme (FP7) and elsewhere.

The ORECCA web portal

The web information system (namely the ORECCA portal) aims at facilitating data sharing and communication among different stakeholders (partners belonging to the ORECCA project consortium, international organisations, citizen, etc.). The nature of the published data referred to conference papers, research results, faced problems, available technologies, partner information and linked projects and collaborations. Moreover, the platform acts as a dissemination channel for every subject related to the topics addressed by the project.

The portal consists of a back-end area dedicated to content and document management and a front-end for presenting all the
The portal offers different features, according to the specific user type. Public users (i.e. non-registered users or ‘guests’) are allowed to view public contents and use basic services (like a newsletter). Partner users (i.e. registered or authenticated users) have access to all the advanced functionalities, like uploading documents, event creation and many more.

Web portal functionalities

The main functionalities of the web portal developed are the following:

- **Project area**
  This area represents the first contact visitors have with the project and is composed by pages describing and explaining ORECCA main objectives and pages that deeply examine all the various project’s elements.

- **Consortium area**
  The area contains the presentation of the ORECCA partners, with a dedicated page for each member of the consortium, containing the description of the partner and all the contact information that should be provided, such as project referents, phone numbers and email addresses.

- **Document area**
  Management of documents uploaded and shared among partners is a key point of the platform. Documents are divided in two sections: private and public. The public section contains all the documents available to the public users (guests). The private section is reserved for the authenticated users, i.e. users belonging to a project partner.

  Documents are divided in four folders (first level folders), one for each of the following themes:
  - policy
  - technology
  - scenarios
  - roadmap.

  This structure is the same both in the private and in the public folder.

  Each one of these folders can contain a variable number of sub-folders (second and eventually further level folders) which are called ‘Sub theme’ folders.

  Users write / view permissions are easily customisable and it's possible to restrict these permissions to particular user classes. In the basic setting, each authenticated user can upload documents in every theme folder / sub-folder of the private area, but advanced settings can restrict upload permissions to a specific theme-related set of folders / sub-folders for each user.

  Every document uploaded by an authenticated user could be marked as ‘draft’ or ‘final’. The other authenticated users can view the document and comment it, thus creating a perfect environment for sharing ideas, suggestion and improvements for the project.

  The authenticated user who first uploaded the document (owner) can also add new versions of it. All the different releases are stored in the system and can be accessed in a click. This function is called ‘versioning’ and allows to create a work-place where all the users from the different partners can share their thoughts and ideas on the various activities and check the advancement on the development process, by downloading the newer versions of the documents.

  When the document is completed and reviewed, the owner can request the portal administrator to publish the document in the public section. This action triggers an e-mail notification to the portal administrator that validates and publishes the document in the corresponding folder / sub-folder in the public directory.

  When a document is published, it can also be accessed by guest users. Only the final versions are made publicly available, while the various drafts that preceded them remain stored in the private directory. Public discussion over various themes and...
documents can be started in the forum.

- Events area
Management of events is another important feature of the portal. All ORECCA related events, such as periodical internal meetings and presentations, as well as external events that may be of interest for the ORECCA community, can be listed in a dedicated event area.

The events are made accessible through a graphic calendar, with a daily, weekly or monthly view. For the specific day selected, a brief description of daily events is provided. Clicking on the single event leads to a dedicated event page. Creation of different event types is supported, like multi-day events.

- Activities area
In order to inform about how the ORECCA work plan is organised, the area is expressly dedicated to describe in details how the activities are structured among partners.
From the main page, that depicts the overall work plan organisation, it’s possible to access the details of the single jobs that compose each project activity. Each job is described with the involved partners, the work completion progress and links to external resources and the internal dedicated page.

Statistics of the use of the platform

- Internal usage
Document management (private area):
- 160 documents available, organised in 12 main-folders and 22 sub-folders;
- about 2000 total downloads;
- more than 15 different partners have actively uploaded documents.
Press area:
- 12 documents published.

- External usage
Period from 29 April 2010 to 6 September 2011:
- 8397 total visits
- 48 774 page views (means that the average visitor reads approximately 6 pages)
- 4327 absolute unique visitors
- 5 min time on site
- visits came from 98 countries (most visits are from partners’ countries, including US).

Web portal ranking

'Orecca' Google search:
- 9 out of 10 first-page results from Google are related to our project.

'offshore renewable energy conversion platforms' Google search:
- 7 out of 10 first-page results from Google are related to our project.

'renewable energy conversion platforms' Google search:
-
- 6 out of 10 first-page results from Google are related to our project.
- Marina Platform is also present.

Web-portal related dissemination activities

Press area:
- 12 documents published;
- about 2050 downloads.

ORECCA workshops pages:
- 10 documents published;
- about 750 downloads.

ORECCA project info:
- 1 issue published, 2nd issue soon to be;
- about 1050 downloads.

Other dissemination activities

During the project, two public workshops have been organised:
- 'The potential for energy conversion platforms in Europe: resources, technologies', held in the Hague, the Netherlands on 4 and 5 November 2010;
- 'Outlining the vision for future energy conversion platforms in Europe, held in Milan on 6 and 7 June 2011.'

List of websites:

Related documents

135248221-8_en.zip

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