Workroom on Renewable Energy: A new way to learn and develop the imagination creating concepts.

Rico-Secades M.
University of Oviedo
IEEE senior member - Ce3i2 group
Asturias - Spain
mrico@uniovi.es

Calleja A.J.
University of Oviedo
IEEE member - Ce3i2 group
Asturias-Spain
calleja@uniovi.es

***Abstract*—The WRE is an offer for students projects (degree, master, pre-doc (PhD) or pos-doc), to be performed in a multidisciplinary context around Renewable Energy and Environmental Issues.**

WRE is running since 2010. WRE is based on a methodology of project-based learning (PBL) and seeks to promote teamwork, multidisciplinary, technical proficiency in English and promoting collaboration and business participation.

One important goal is to encourage and to improve creativity of students.

WRE also aims to be a learning platform for the presentation of works and papers in journals and conferences, promoting the work of initiation into these aspects of the disclosure and dissemination of knowledge.

WRE try to cover a wide range of technological activities in a multidisciplinary context of collaboration. The main topics covered for WRE are renewable energy, energetic efficiency, power electronics and environmental issues.

Keywords—Renewable Energy, Energy Efficiency, Power Electronics, Project Based Learning (PBL).

I. INTRODUCTION

The new curricula require us to reflect on our teaching and research methodologies, to introduce elements that encourage the student while learning to integrate it into the learning process, encourage teamwork, participation, in addition to adapt a time dramatic technological change, a time of crisis and opportunity.

In EU context, the Bologna reforms undertaken since college give us an opportunity to introduce new learning strategies appropriate to our times and technological advances with which we live.

So in the year 2011, thrust advantage of Power Electronics course of EPI of Gijon, WRE was born.

In Spanish it is called "Taller de Energías Renovables" or only "Taller WRE".

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WRE emerges as a methodology aimed from the beginning to make a bridge between formal teacher training and Engineering Final Project (at any level, bachelor or master).

Fig 1.- A WRE flyer

Thus, the workshop WRE promotes R&D in the field of Energy Efficiency, Renewable Energy, Electrical Energy Conversion and Power Electronics. Engineering topics are

exciting and motivating. These exciting topics arouse the interest of engineers of all specialties.

The topics proposed are framed in different topics from Power Electronics applied to Electrical Energy Conversion and Renewable Energy such as wind power (onshore and offshore) and solar energy, to more specific topics such as renewable energy source marine, such as wave power and tidal power.

Topics of great economic and topical as energy efficiency related to lighting and the use of high-efficiency LED diodes, through the smart grid (smart grid), efficient use of water and so on, too numerous to mention here all the topics covered being able to find more details on the WRE website [1].

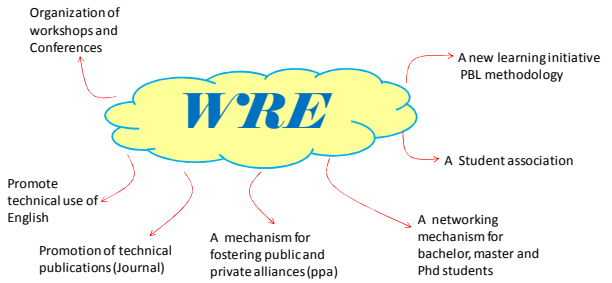

Fig. 2.- What is WRE?

The whole process is based on a methodology of project-based learning (PBL - "Project Based Learning") and seeks to foster teamwork, the multidisciplinary, technical English proficiency and fostering collaboration and business participation.

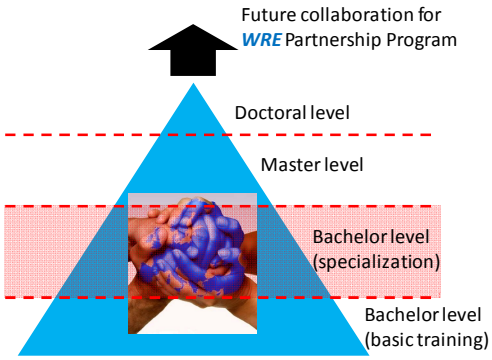

Fig. 3.- Implementation of WRE in different engineering levels.

With WRE sought, above all, promote student creativity, motivate them to acquire the skills required to develop a topic you find interesting.

WRE also aims to be a learning platform for papers and papers in specialized journals and conferences, promoting the work of initiation into these aspects of the disclosure and dissemination of knowledge.

This is the third year of the WRE operation and it has the support of teachers from various areas of knowledge, among which we can mention Electronic Technology, Manufacturing Engineering, Electrical Engineering and Financial Economics.

With enough effort, has established collaborative framework that allows the development of collaborative projects with students from different specialties.

More and more students of different specialties come with us for work and collaborate with WRE.

This year since the organization of WRE want to launch new initiatives, we have many ideas and new projects. We are already working on the launch of a periodical (journal WRE) annually with the work carried out in WRE activities.

Also the presentation and defense of the work undertaken by students in different subjects and activities, we want to evolve it into an international conference (WRE workshop) and with the aid received awards and business partners, we provide scholarships some projects to make way for the prototyping laboratory and to delve into some of the issues of most interest.

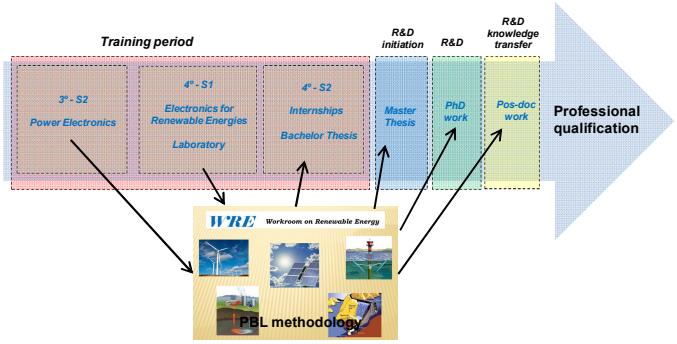

Fig. 4.- Implementation of WRE in Polytechnical Engineering School of Gijón in Span (EPI- GIJON-SPAIN).

To carry out these activities, the WRE also promotes the possibility of business cooperation in what we have called WRE partnership.

II. WRE PATNERSHIP PROGRAM

The level of business collaboration most basic in the WRE partnership Program is the Sponsor, in this embodiment partner financially supports the work of the WRE, but not a promoter of initiatives and leads any WRE activity.

At this level the partner receives regular reporting activities, state of new ideas and initiatives , be aware of the state of the art technology in these fields of work (technology watch) and maintained contact for future monitoring and incorporations .

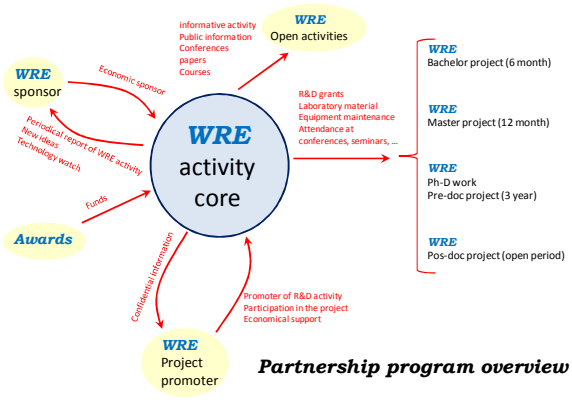

Fig. 5.- WRE Partnership Program

The economic interest of the sponsor will be devoted to fund scholarships and research training, student mentoring work, laboratory materials, and dissemination of workshop activities and maintenance of equipment.

The partner can become more active and to promote and lead a WRE activity which integrates a graduate student to develop their final engineering project (degree or master level), promote the development of a PhD work or even lead a Pos-doc activity.

The partner is integrated into the team and sets guidelines the same. The information generated by the R & D work in this case is confidential and its disclosure require authorization from the partner.

The promoter postdoctoral activity is the highest level of business collaboration and the maximum level of involvement of a company with WRE involves R & D of high complexity and ambitious.

Promote and encourage research activity at the highest level, in cooperation with companies is one of the most ambitious goals of the WRE initiative.

The WRE perform dissemination of the work done (conferences and magazines) which will mention the collaboration of its partners.

III. WRE OpenCourseWare initiative

During the development of the work and projects of WRE, it has been identified the need to provide training material and general information to students, this common material is now made public and free access in order to join to the general initiative OCW [3].

WRE-OCW has born with the object to provide free learning materials in the context of Power Electronics, Renewable Energy and Energy Efficiency [2].

Fig. 6.- WRE OpenCourseWare initiative.

WRE-OCW materials are free and openly licensed, accessible to anyone, anytime via the internet.

IV. WRE implementation results

In the general context of WRE work has been promoted by integrating different disciplines, a good example is the study of technical, economic and financial analysis of floating structures for offshore floating structures as reflected in Figure 7. This was one of the first works carried out in WRE context.

Fig. 7.- Multicisplinarity in WRE ("Technical, economic and financial study of an offshore wind farm ") work done for Mechanical Enginnering degree and advised by Electrical, Electrincs and Economic areas.

Some works have won awards and recognition in a local context recognizing the quality of work and effort to integrate technologies. The sample given in Figure 8 is a good example.

With the participation in EDP University Challenge 2012 awards, WRE reach an important recognition and visibility. In these awards two WRE works have been finalists and one of them has won the first prize (figure 9).

Fig. 8.- First award received in 2011 "Solar-Wind powered lamppost: Structural design and materials" work done for Mechanical Enginnering degree and advised by Electrical and Mechanical areas.

It has been a major boost to this initiative born in EPI Gijon (Spain), through this awards WRE received financial aid and new business collaboration proposals allow us to implement new ideas and initiatives WRE organization are planning for the future.

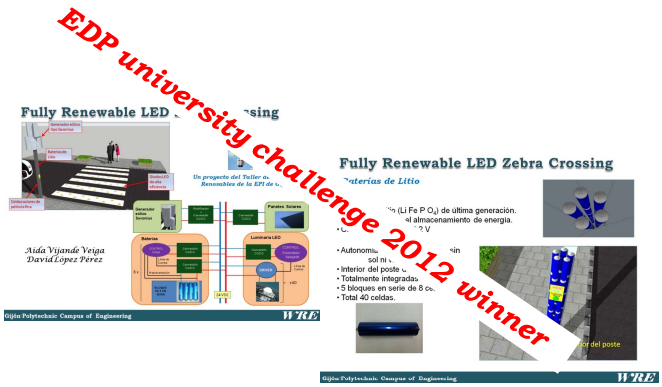

Fig. 9.-EDP university challenge 2012 award winner. "Fully Renewable LED Zebra Crossing" work done for Industrial Electronics and Control Enginnering degree

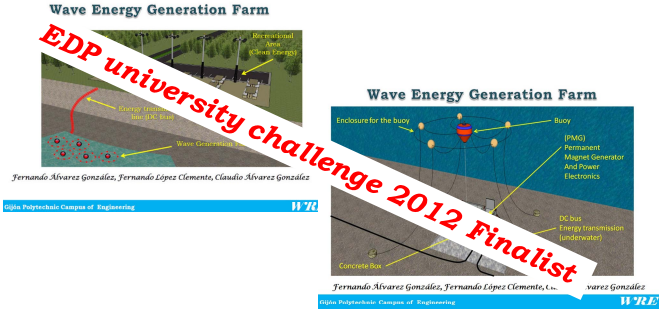

Fig. 10.- EDP university challenge 2012 award finalist. "Wave energy generation farm" work done for Industrial Electronics and Control Enginnering degree

From WRE also seeks to promote international collaboration and it is worth mentioning the participation for two consecutive years with DELFIN Mexican program, whereby students are integrated into the activities of WRE by summer stays.

Figure 11 shows a "family" photo with students participating in WRE-DELFIN program this year (2013).

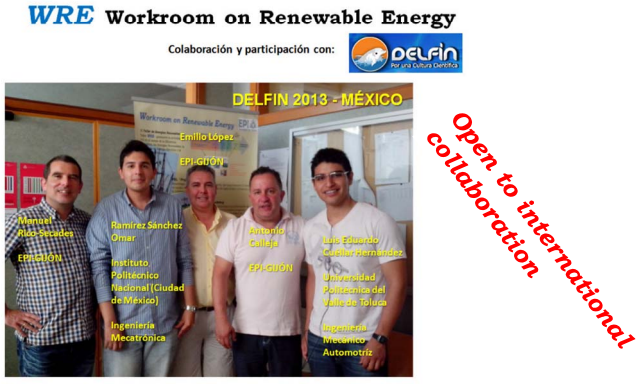

Fig. 11.- WRE is open to international collaboration. WRE with DELFIN program in 2013 (Mexico).

CONCLUSIONS

The paper presents WRE, a new initiative and an offer for students projects (degree, master, pre-doc (PhD) or pos-doc), to be performed in a multidisciplinary context around Renewable Energy and Environmental Issues.

WRE is based on a methodology of project-based learning (PBL) and seeks to promote teamwork, multidisciplinary, technical proficiency in English and promoting collaboration and business participation.

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WRE covers a range of technological activities in a multidisciplinary context about renewable energy, energetic efficiency, power electronics and environmental issues..

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