

THE TRAINWIND PROJECT: AN E-LEARNING PLATFORM FOR VOCATIONAL TRAINING IN WIND ENERGY TECHNOLOGIES

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Abstract: This paper reports on the achievements of the TrainWind project, which promotes Information Communication Technology (ICT)-based e-training in the Wind Energy Technology (WET) sector. The TrainWind e-learning platform, developed during the project, provides an integrated environment for acquisition of knowledge, progress evaluation, and interaction among trainees and between trainees and professors. The training process is directed towards young specialists, who are willing to prequalify, or to complement their knowledge and skills for operating the latest technologies in the WET sector and to improve their qualification on maintenance of WET equipment. In order to demonstrate the benefits of remote vocational training, the project implemented the TrainWind Pilot Courses in Bulgaria and UK.

Keywords: vocational training, remote training, distance education, e-learning platform, maintenance of equipment in the wind energy sector.

I. INTRODUCTION

The European Wind Energy Association (EWEA) recently reported that the European Union Wind Energy Sector expects the opening of over 250 000 new job positions during the next decade. Official data show that each megawatt (MW) installed wind energy power creates approximately five new job positions for qualified personnel.

On the Bulgarian job-market, the demand of specialists on the operation and maintenance of wind energy equipment is estimated to approximately 1500 new job positions [1]. In response to this steadily increasing demand, the TrainWind project offers new opportunities for professional training of technical staff.

II. THE TRAINWIND PROJECT

Making use of contemporary information and communication technology, the TrainWind project [2] created an e-learning platform, which offers distant learning courses on wind energy equipment operation and maintenance. These courses are focused on the acquisition of basic knowledge and mastering practical skills, demanded by the expanding job market in the Wind Energy Sector.

The training process is directed towards the young specialists, who are willing to prequalify, or to complement their knowledge and skills for operating the latest technologies and maintenance of WET equipment. The TrainWind project benefits the technical staff responsible for the operation and maintenance of equipment in the Wind Energy Sector and facilitates their professional development.

1. The TrainWind e-Learning Platform

The TrainWind e-learning platform¹ is implemented on eFront [3] and provides all the necessary tools needed by developers of distant-learning courses. Most importantly however, the TrainWind e-learning platform incorporates a variety of tools facilitating the creation of interactive and animated content, such as interactive figures, equations, tables etc. Comprehensive description of these tools is available in [4].

2. The TrainWind Pilot Courses

The first TrainWind distance learning course, namely the TrainWind Pilot Course on WET operation and maintenance, has already been implemented on the e-learning platform. The TrainWind Pilot Course is focused on gaining basic acquaintance with the WET technology and on mastering practical skills demanded by the expanding job market in the EU Wind Energy Sector. The Pilot Course is offered in four EU languages: Bulgarian, Dutch, English, and Spanish. The trainees are offered to select their preferred language upon enrolment and afterwards can switch among the four available languages. Such flexibility facilitates the mastering of domain-specific terminology, which is prerequisite for communication with international companies in the WET sector, and the use of foreign language literature and documentation for further self-instruction and professional development.

The TrainWind Pilot Course deployed on the TrainWind e-learning platform incorporates

¹ <http://195.216.228.11/www/index.php>

five training units. Each unit consists of six themes and one or more progress evaluation test. Once a trainee completes successfully all tests for a given unit, s/he is granted access to the next unit. The course units are kept self-sufficient and include introductory section, comprehensive exposition on the topic with sufficient mathematical support, tables, graphics, pictures, video-clips and animations. The key equations, calculators, tables and figures are animated, and the most important among them are made interactive, so that the trainee can enter own data and visualize graphically the representation of different dependences and physical laws.

In addition to the course units, the working environment in the TrainWind e-learning platform incorporates a set of auxiliary tools, such as: a calendar, a search form, an internal messaging system etc, which allow for effective learning,

planning and communication among trainees and between trainees and professors.

3. The User Interface

As shown in Figure 1, the main panel of the user interface consists of three areas:

- (1) The contents area. In Figure 1 it shows the first unit in the English language version of the TrainWind Pilot Course (cf. Figure 2),
- (2) Auxiliary tools for planning, searching, reporting and communication among trainees or between trainees and professors (cf. Figure 3 and 4),
- (3) Functionality for controlling the account status, the preferences of the current user account, fast switch to dash-board view, logout of the e-platform, etc.

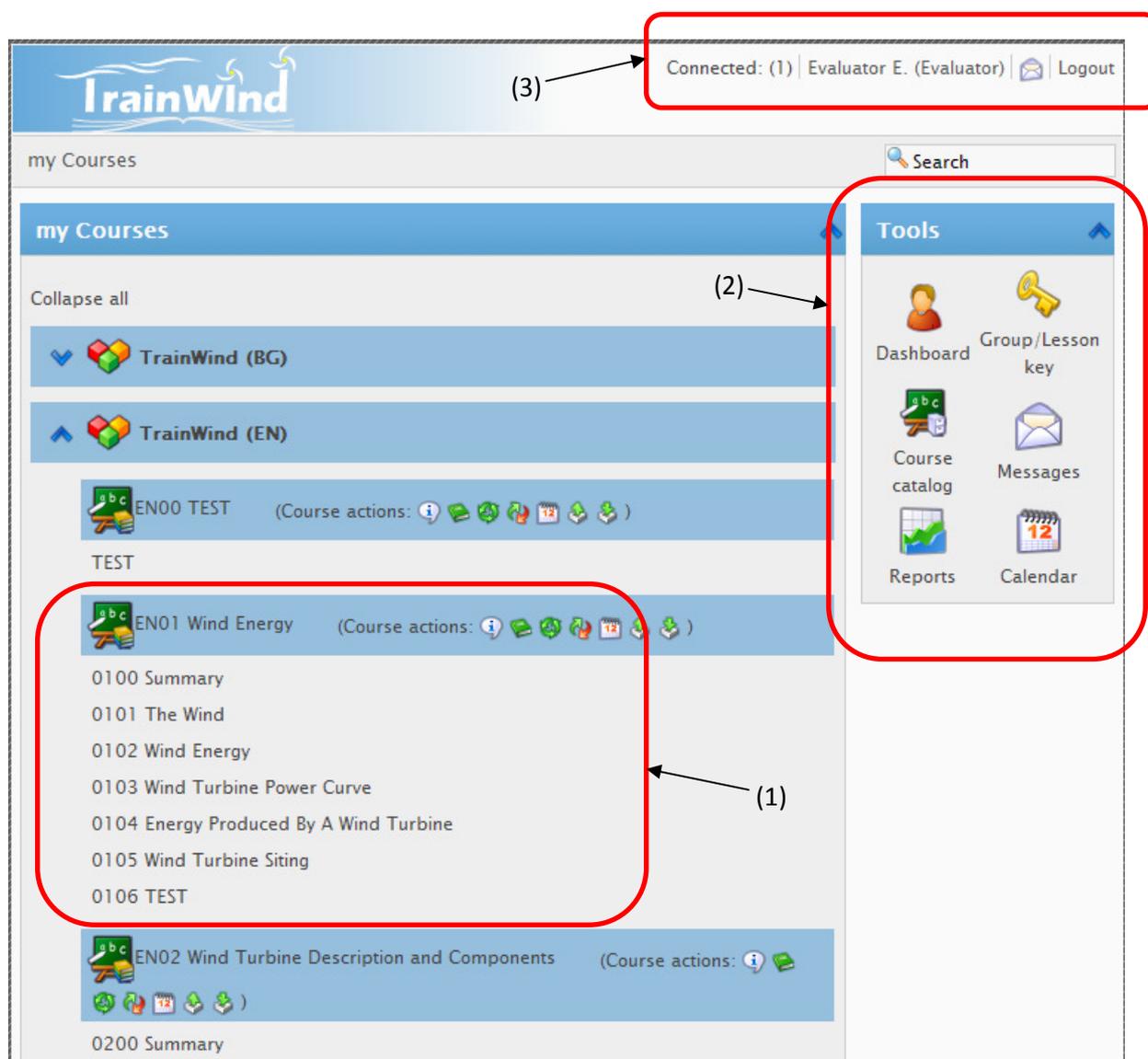


Figure 1. Main panel of the TrainWind Pilot course

Speed Control – Pitch Control

Speed control

Speed control system through which pitch control is a mechanical process to change the blades' pitch angle to prevent overloads in the gearbox and generator due to inadequate speeds. There are two types of actions in this type of control:

- When wind speed is high and increases rated power: in this case and, considering that pitch angle system is a mechanical system (therefore it does not work immediately), the sliding increases prompted by the control signals that control output several times per second, so the rotor rotates faster, activating the pitch angle system to balance the situation. Once the situation reaches balance, the sliding goes down by reducing output.
- When wind speed is low and decreases rated power: in this case, the pitch angle is moved to optimum, to increase the power obtained from the current low wind speed.

Figure 2.35. Pitch control visualization

Lesson material

- Summary
- The Tower
- The Rotor
- The Rotor – Vertical
- The Rotor – Horizontal
- The Rotor – Hub
- The Rotor – Blades
- TEST: The Rotor
- The Nacelle
- The Nacelle – Weatherfane...
- The Nacelle – Electric Ge...
- Gearbox
- Brakes
- Control Systems – Power C...
- Speed Control – Pitch Con...
- Speed Control – Stall Con...
- Speed Control – Active St...
- Speed Control – Yaw Contr...
- Safety Systems
- Hydraulic Systems
- Virtual Simulation
- TEST: Basic Components of...

Lesson progress

Unit operations

- Print unit
- Open unit in popup window

Figure 2. Sample screen illustrating the organization of content in the TrainWind Pilot Course

TrainWind Connected: (1) | Evaluator E. (Evaluator) | Logout

my Courses » EN02 Wi... » 0202 Basic Compo... » Options for lesson "0202 Basic Components..."

Search

Options for lesson "0202 Basic Components of a Wind Turbine"

Lesson options | Layout | Lesson initialization | Import lesson | Export lesson

Lesson options

- Auto complete
- Content tree in first page
- Reports
- Report an error
- Print content
- Start/resume
- Completion percentage block
- Unit options block
- Right sidebar
- Left sidebar
- Student control panel
- Dashboard
- Horizontal bar

Lesson modules

- Theory
- Examples
- Tests
- Lesson rules
- Comments
- Announcements
- SCORM
- IMS
- Smart content
- Calendar
- Glossary
- Lesson information

Figure 3. Tools for organizing, planning and evaluation of trainees

Figure 4. Tools for planning, search and communication among trainees and professors

4. The Trainees Progress Evaluation Tools

After enrolment for a TrainWind course, trainees' entry level is evaluated via a competence level test. Depending on the scores trainees achieve on the entry test, they are categorized as *beginners*, *advanced*, or *very advanced*. Each of these categories follows a different path through the curriculum:

- beginners are obliged to go through the content of all the 5 training units,
- advanced trainees have the option to skip reading the first unit content and can proceed directly for the first unit output test,
- very advanced trainees have the option to skip reading the content of the first two units and can proceed directly to the output test of the first unit, and if successful, directly to the output test of the second unit.

After the successful completion of a TrainWind course, trainees are subject to assessment through the TrainWind Assessment Tool [5].

III. CONCLUSIONS

Making use of contemporary information and communication technology, the TrainWind project created an e-learning platform, which offers remote

training courses on wind energy technology operation and maintenance. These courses, offered in four languages, are focused on the acquisition of basic knowledge and mastering practical skills, demanded by the expanding job market in the Wind Energy Sector. In this way, the TrainWind project enhances the opportunities for professional realization of young specialists and facilitates the professional development of technical staff on the operation and maintenance of equipment in the WET sector.

The TrainWind project can be seen as an important contribution towards the implementation of the European Commission long-term policy in support of the Renewable Energy industry in the European Union.

IV. ACKNOWLEDGEMENT

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