

**TEMPUS PROJECT JPCR 530194-2012**  
**Energy Efficiency, Renewable Energy Sources and Environmental Impacts-**  
**master study, "ENERESE"**

# **EXTERNAL REPORT**

## **RESULTS AND QUALITY INSURANCE OF THE PROJECT**

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This report prepared within the framework of the TEMPUS project number JPCR 530194 2012 presents findings of the external quality expert related to the realization of the project and accomplishments achieved by the project consortium. To arrive to this conclusions the expert used different information sources – from talks and direct discussions to electronic version using relevant Project documentation and other materials related to the Project and Project issue (new Master Study Program).

## Introduction

The major objective of the ENERESE was to introduce, support and promote the development of the new two years master programme on Energy Efficiency, Renewable Energy Sources and Environmental Impacts at State University of Novi Pazar (SUNP) in accordance with the European state of the art and standards and good practice. The project is funded by European Commission - Joint projects – TEMPUS. The master addresses the broad class of Bachelor engineers in Mechanical Engineering, Civil Engineering, Electrical Engineering and Technology in Serbia, Bosnia and Herzegovina and Montenegro. Part of the project, which is of particular educational interest, is the training of lecturers, future lecturers (assistants) and university coworkers and also students by EU experts at SUNP and at EU universities, also with the aim to bring master curricula, teaching methods, laboratory and library facilities up the recognized standards. Finally, during the ENERESE emphasis has been given to reshaping curricula in general subjects, to increase the proportion of experimental and practical work, to introduce practical placements and to upgrade existing courses in general.

The major objective of the ENERESE, as already mentioned, is to structure the development of the new two years master programme at Energy Efficiency, Renewable Energy Sources and Environmental Impacts at State University of Novi Pazar (SUNP) in accordance with the European standards. The Consortium and the partners of the programme which supported the programme's targets are presented below.

## **Consortium**

1. **State University of Novi Pazar** (Applicant) - Serbia
2. **University of Belgrade** (Partner) - Serbia
3. **University of Nis** (Partner) - Serbia
4. **Serbian Chamber of Engineers** (Partner) - Serbia
5. **Serbian Energy Efficiency Agency** (Partner) – Serbia\*
6. **University of Sarajevo** (Partner) - Bosnia and Herzegovina
7. **University of Banja Luka** (Partner) - Bosnia and Herzegovina
8. **University of Montenegro** (Partner) - Montenegro
9. **Ministry of Economy of Montenegro** (Partner) - Montenegro
10. **Chamber of Economy of Sarajevo Canton** (Partner) - Bosnia and Herzegovina
11. **University of Zilina** (Partner) - Slovakia
12. **University of Ljubljana** (Partner) - Slovenia
13. **Aristotle University of Thessaloniki** (Partner) - Greece
14. **TU Bergakademie Freiberg** (Partner) - Germany

\*At the beginning period of project realization Serbian Energy Efficiency Agency has shut down and due to this has replaced with Ministry responsible for Energy.

The purpose of the evaluation is to understand the value of the quality of the proposed Master Program, material presented to the courses targeting to an integrated approach of the significant issue of energy efficiency, renewable energy sources and environment. Major findings and conclusions are described in details below, prospectively on the working packages (WP). Following the findings, recommendations for enhancing the course modules and the teaching process as such are presented.

### **WP 1 Rational Use of Energy (RUE) strategies and its presence at universities in WB and EU partner countries**

Activities on WP1 work package are completed.

Performed an analytical review of energy efficiency on the demand side and the use of renewable energy in the Western Balkans (WB) and EU countries (the countries of the

Project partners). The conclusion is that the Western Balkan countries recently established a systematic way to improve energy efficiency at all levels of consumption (buildings, industry, transport, cities and municipalities, and national level), while the EU's experience in this regard is of great benefit. It also analyzed the opportunities for development and trends in the field of energy efficiency can be expected in the Western Balkans. In this regard, there are opportunities for improvement of higher education in the Western Balkan countries through the introduction of a new program, which was the main subject of the project ENERESE. After reviewing existing university programs of study showed that the new program areas should be oriented to the creation of new jobs, which is exactly the characteristic of energy efficiency and renewable energy. The project ENERESE has defined a unique master study program in the Western Balkans, in accordance with a modular structure ("Bologna") and with quality output competence in the practical application of knowledge and scientific-research activities.

### **Recommendations:**

- Relevant state and social institutions in the Western Balkan countries need to continue the systematic improvement of energy efficiency and wider use of renewable energy sources, taking into account the practice and application of EU directives
- Relevant (technical, technological, technical physics, etc.) universities of Western Balkan countries should continue with the introduction of new courses and programs of study in the field of sustainable energy use and with the enhance the existing study programs, like ENERESE is

### **WP2 Development of new Master study programme**

Within this activities the final version of new joint master curriculum is completed for the RS (Serbia) and ME (Montenegro) university partners (SUNP, UB, UN and UME), as well as University of Sarajevo (SA). Two modules (oriented toward Mechanical Engineering and Buildings&Construction) were defined. The study programs in BA university partner has used this joint program, but they have made some minor

changes and added to its syllabus some topics of its choice, as long as the main learning outcomes are respected. One new upgraded master curriculum with two modules is developed. Adopting developed master program ENERESE as the joint program the horizontal mobility is achieved, while vertical mobility is introduced through defined courses for LLL short seminars. The acceptance of common study program was signed by WB and EU partners.

**Recommendations:**

- Continue to improve the quality of academic programs in the field of energy efficiency, renewable energy and environment
- Because of the administrative compliance and similarities, especially should cooperate WB universities in the same state (exchange of professors and students, etc.), but interstate cooperation between universities is, also, welcome
- Monitor the modern trends in these areas and work with EU universities

**WP3 Preparation for the implementation of new master programme**

Within activities of the work package WP3 two textbooks and one monograph book have prepared for printing and delivered to the students, as well as ppt presentation and other material in electronic version. The main of that is available on Project web-site within SUNP official web-site. In the second phase of the project has realizing teacher training for WB universities, as well as procurement of necessary equipment and library content at the WB universities. EU project partners have provided teaching materials to WB universities. WB partners on the project began in continuous improvement of library content from books, conference proceedings, professional and scientific journals in the field covered by the project ENERESE.

**Recommendations:**

- Continue improvement of library and laboratory facilities

#### **WP4 Implementation of new master programme**

Activities on work package WP4 have been realized. Thus, in joint ENERESE program that is implementing 2013/2014 school year at SUNP 15 students are registered in November 2013, out of that 6 from SUNP, 3 from UB, 3 from UN and 3 from UME. In 2014/2015 school year the lectures within predicted and defined joint Master Study Program has continued at SUNP and started at UME. Beside previous registered students 2 students from UBL and 2 students from USA are added. The student mobility has realized in third project year.

#### **Recommendations:**

- Continue consultations between the project partners concerning to the lectures and topics that are needed new master degree program
- Establish student practice in relevant WB companies and realized projects
- Define student practice in EU universities for students of WB universities

#### **WP2-WP4 Joint review**

The specific Task (WP4) presents an overview of the teaching material presented at the existing one year Master programme at SUNP (Energy efficiency in buildings). Within the scope of this project, and in the frame of this deliverable, emphasis was placed on information referring to:

- economy and investments, namely on Macroeconomics, capital cost, debt and equity structure, inflation, fiscal policy ,
- economic features of an investment, namely on Capital expenses, depreciation, revenues and expenses, cash flows, salvage values
- energy investment plans and time, namely on The time value of money, lead and implementation time, cost concepts and identification
- investment appraisal methods for energy production and energy conservation investments, namely on Net Present Value, Internal Rate or Return, Life Cycle Cost, Levelized Cost of Energy, Depreciated Payback Period

- tools to promote energy policies and renewable energy sources, namely on Feed in tariffs, Net metering, Alternative subsidies' schemes
- costing and pricing of energy, namely on Fixed and variable cost of power generation, sensitivity analysis, break even point
- Life Cycle Analysis of energy projects
- sustainability certification schemes and tools
- large and small scale energy business structures
- financing schemes, namely banking, equity financing, crowd funding etc, and
- legal aspects of energy projects, focusing on Large scale building refurbishment and renovation schemes, district heating systems etc.

The completion of the Master programme (which corresponds to 120 ECTS) has to be done in two years. The draft of curricula and the development of main course outlines with Diploma supplement is done in such a way that it ensures harmonization with European Standards and Directives. To a great extent this is mirrored in the packages of knowledge delivered by the teaching materials.

Another main aim is for the students to gain additional skills in topics that have not been widespread in the existing curricula, such as economics, management, professional communication, usage of state of the art software packages in their work, dealing with modern technologies and ability to handle professional communication in English. This was particularly important as it is a prerequisite in order to enhance the students' chances for employment and to help them to take a proper place in the regional and international society and economy. It is very expected that such professionals will become highly competitive on the local and regional labour market. Students have the choice of two modules of technologies to specialize in (1) Energy efficiency in buildings and RES and (2) HVAC and hybrid systems using RES (Buildings&Construction and Mechanical Engineering groups).

A common mode for both modules includes subjects related to civil engineering, mechanical engineering and electrical engineering as well as to the subjects devoted to environmental science and technologies and management skills. Previously developed set of electives attempt to establish a uniform level of knowledge on RUE. This is to a great extent happening with success.

The detailed program has been prepared in coordination between WB and EU partners, based on specific areas of interest, expressed by WB partners and by assessing the level of knowledge and skills featured by the prospective students. Joint working-groups, composed of lecturers in similar discipline from WB and EU partners, have worked during the project meetings but also in bilateral meetings, to draft and then finalize the course outlines. Each WB partner university was free to add to its syllabus some topics of its choice, as long as the learning outcomes are respected. Workshops with EU lecturers have been organized dedicated to these issues in second and third year of the projects.

Selection of teaching staff from EU partner universities has been carefully planned. They were involved in the specific subjects lecturing at master study programme at WB partner universities. Intensive, compressed courses (30 hours of lectures in 1 week's time) have been delivered by EU experts in WB partner universities, mainly in Novi Pazar, so as to complement the teachers' training scheme.

Retrained teaching staff have been included in the lecturing process at WB universities in the third project year and are engaged as mentors during the master thesis preparation. As a special form of rewards and stimulation for students which show best evaluated results, student's internship was organized in EU countries with covering of basic costs of travel and stay using project funds. The mobility of the selected best students to EU universities is planned at 2 weeks summer seminars which will be validated with 6 ECTS. Furthermore, students have had opportunity for independent research visits to EU universities, working on projects and specific research tasks.

The training material for modules are evaluated based on three main criteria the:

- Quality of Content
- Potential Effectiveness as a Teaching/Learning Tool
- Planning of the course

### **Quality of Content**

This criteria describes two general elements about the content of the material — its validity and its significance. The content of the training material is characterized as accurate and reliable. It depicts the reality and it is up to date compared to other

relevant information and resources. Its content is complete within the scope of the course providing the necessary information.

### **Potential Effectiveness as a Teaching/Learning Tool**

The training material can be used as a methodology to solve “new” problems concerning energy efficiency and energy economics. The methodologies and tools presented are clearly described and compared so the student can choose the appropriate tool or methodology to solve the problems occur. The teaching style is not so innovative, it could be characterized rather classic but it is focused on interaction between students and teachers, case studies, illustrated examples, overviews and summaries where is appropriate.

### **Planning of the sessions**

The sessions of the training material are efficiently related and have clear aims and outcomes based on the scope of the master programme and the individual target of each session. The teaching methods were described as satisfactory and appropriate for the tasks presented. The sessions drawn to satisfactory conclusions and encourage further action.

A weak point of the session planning is the communication with students due to different locations. The amount of new ideas, methodologies and terms provided is significant and difficult to be clearly understood. Some suggestions on this direction could be the redesign of the time schedule increasing the teaching hours based on the sessions' degree of difficulty and the amount of material to be processed by the students.

### **WP5 Quality control and monitoring of master study programme**

Quality control of master program study is conducted regularly and systematically through self-assessment and external verification of quality. At the beginning of the project realization the expert counsel was established from 6 WB partner universities members and 2 members from EU partners. Within this activities at Senate of SUNP the completed curricula has adopted based on developed master program within

ENERESE project and it is transferred to CAQA (Committee for Accreditation and Quality Assurance of National Council for High Education established by the Government of the Republic of Serbia) for further quality assessment. The decision and accreditation certificate are obtained by the CAQA. This procedure was following by other WB project partner universities, as well, with respectation their legal and procedural specificities. As the leading partner for this WP, QA office of SUNP presented internal QA report. Some kind of external assessment of QA activities by EU partners has been done in the second part of second Project year.

**Recommendations:**

- Continue monitoring and internal quality control master study program
- Upon realization, analyze feedback questionnaires with scores of professors by students

**WP6 Dissemination of the project results**

Project website <http://www.enerese.np.ac.rs> is operational and regularly updated. Certain activities on the creation of promotional material created on study programs have realized (leaflets, poster). Dissemination activities are organized on an internal level (college and university), at national and international conferences, intercoach meetings and in the local media.

**Recommendations:**

- Organize actions to promote newly created study programs in high schools, in which the potential future students in direct contact and distribution of promotional materials, presented the study program and the prerequisites for enrollment
- Intensify cooperation with non-academic partners (joint participation in conferences, seminars, exhibitions, etc.)
- Use the opportunities to promote the project and its results at national and regional level

## **WP7 Sustainability of project achievements**

Project sustainability is achieved through the accreditation project curricula by the CAQA that is already done in RS. On this way is secured program financing after completion of Project in next three years. Also, SUNP Senate has accepted accredited project program for the realization in following years. The master study programs ENERESE at UNSA, UNIBL and UME are accepted by their Senat and will be accredited at university level as for the time being in BA and in ME there are not National Accreditation Commissions.

### **Recommendations:**

- Continue implementation of procedures relating to the activities of accreditation of new study program at WB universities

## **WP8 Project management and coordination**

Overall project management and administration are realized by Project Management Team (PMT), that is the major project management body. Work of PMT is prepared and organized by SUNP in coordination with other partners. So far, total of 12 PMT meetings (including kick-off meeting at SUNP) were organized. The management of the project has developed matrix organizational structure appropriate for the effective and efficiency management. The project participants have intensive mutual communication. Complete financial project management is organized by Financial Project Manager and his team.

### **Recommendations:**

- Continue implementation of the agreed activities of project management and communication with all project partners

## Conclusion

During the project period the new curricula established at partner universities included the following activities:

- Definition of strategies for the new master programme
- Development of the new curricula
- Drafting of course outlines
- Methodology improvements for the new master programme.
- Teaching staff from WB universities has been retrained at EU partner universities where they attended courses, tutorials and scientific seminar/conferences on specific topics included in the Master curricula. Those activities are still going-on as this report is written.
- Seminars by EU experts at WB partners have been realized and are complemented to the teaching staff training scheme.
- New textbooks have been developed and published. Laboratories and libraries at regional partners are also in the process of being renewed.
- At the start of the second project's year the new master programme started its implementation.
- ECTS is in the process of being implemented and its calculation is based on the EU standards and partner countries experience.
- Quality control and monitoring is provided by the project management team.
- Internal assessment is done by QA offices, the university Senate and Ministry of education and external assessment by EU partners
- Dissemination process has been, and is being, performed during the whole project period with the elaboration of specific dissemination materials
- Sustainability of project results will be achieved through systematic validation by the faculty and university councils and by the accreditation recognition of the Ministry of Education
- Project management is provided by the coordinator and Project Management Team (PMT) assisted by administrative staff members for the follow up of project activities and project expenses

This report summarizes the results of the evaluation of the course modules presented in the frame of the new study programme at all WB partner universities. The draft of curricula and the development of main course outlines with Diploma supplement do ensure harmonization with European Standards. Students are gaining additional skills, such as management, professional communication, usage of professional software packages in their work, dealing with modern technologies and ability to handle professional communication in English. This is mirrored in the educational material provided.

Based on the overall impression obtained from analyzing the educational packages, the project has succeeded in the goals set and has established a maturity that can ensure its sustainability.