



## **Report on training in environmental economics, energy efficiency and renewable energy sources within TEMPUS - Energy Efficiency, Renewable Energy Sources and Environmental Impacts - master study "ENERESE"**

*Period: 01.09.2014. – 15.09.2014.*

*Place: Aristotle University of Thessaloniki, Greece*

*Supervisor: Prof. Agis M. Papadopoulos*

### Timeline of activities

<b>Period of time</b>	<b>Activity</b>
30.08.2014	Arrival in Thessaloniki;
01.09.2014	Presentation at Aristotle University of Thessaloniki, meeting with Professor Papadopoulos, discussion of purpose and aim of work;
02.09.2014 03.09.2014	– Working on the topics of sustainable energy investments; meeting with researchers from the hosting University; visit to “Solar sports hall of Evosmos”; going through the project of bioclimatic rehabilitation of the Neokitsa, Thessaloniki, discussion with the design team;
04.09.2014	Working on the topics of cost assessment in energy markets, optimal level of pollution, energy conservation and its costs, valuation of costs and benefits;
05.09.2014	Working on basic investment appraisal methods (payback period, profit, rate of return), going through examples explaining every methods advantages and disadvantages;
08.09.2014 10.09.2014	– Working on discounted cash flow methods (depreciated payback period, net present value, internal rate of return), going through examples explaining every methods advantages and disadvantages, comparison with basic appraisal methods;
11.09.2014	Going through Case study of operating Integrated combined cycle gas-fired power plant of “AP SA” company
12.09.2014	Working on appraising the feasibility of Wind generators and small hydroenergy plants
15.09.2014	Final meeting with Professor Papadopoulos, discussion on the work done; leaving Thessaloniki

## Narrative report

The main focus of this training was to understand and distinguish various economical and financial indicators of energy efficiency and renewable energy sources related projects, as well as the impact they produce on the environment and the society.

Special attention was given to the investment appraisal methods, both conventional and method based on discounting, since the understanding of them is necessary for making decisions on whether the project is feasible or not.

After introducing basic terms for comprehending the idea of energy economics like relevant cash flows, timing of the cash flows, lifetime of the investment etc., every indicator introduced was followed by adequate real life example.

Payback period method has the main advantage in its simplicity since it measures number of years it is expected to recover the initial cost of the investment. For energy related investments, companies usually set payback criterion to check whether particular investment will be accepted or rejected. The disadvantage of simple payback period was practically shown on example comparing two different projects with different lifetime and by introducing profitability of the investment.

Rate of return method allows us to quantify the annual profit in terms of percentage of the capital invested. The importance of the rate of return was shown with the example comparing three different projects with different investment costs and expected returns with the same lifetime.

For payback period and rate of return, the impact of inflation and capital cost were not taken into account. Since the future value of the money invested now will change, it is important to understand the concept of present value as it is the foundation for all discounting approaches to appraise investments. Present value of a future sum of money was explained with proper example and with introducing “present value factor”.

Net present value (NPV) method is highly used in energy industry to assess the profitability of the investments. The expected cash flows on the investment are calculated for every year of the project lifetime and returned to a present value with appropriate rates. Net present value shows whether the investment is viable (positive number) or not (negative number).

Depreciated payback period (DPB) shows the point in time at which savings (profit) pay back the initial investment but with taking into account time, capital cost and inflation.

Internal rate of return (IRR) is of interest if one wants to know what rate of return can be expected on a particular project.

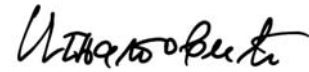
The importance of all three indicators (NPV, DPB, IRR) was shown on the same example used for rate of return method.

At the end of the visit several case studies considering feasibility of investment were examined. The most interesting one, case study on operating Integrated combined cycle gas-fired power plant of “AP SA” company near Larissa, Greece was closely examined in all of its parts: possible energy sources that can be used, the location of the plant, the

technologies applicable, financing the project options, the assumptions made, financial parameters, and finally the analysis conducted and discussing the obtained results.

15.09.2014.

*Report prepared by:*



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