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XXX Međunarodno savetovanje



energija



ekonomija



ekologija

ENERGETIKA 2014.

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Ministarstva privrede,
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Technical and Economical Analysis of Medium Size Photovoltaic System for Supply of Educational Institution

ABSTRACT

The paper presents the results of analysis of technical and economical feasibility of the grid-connected photovoltaic system for power supply of one educational institution. The system consists of a certain number of photovoltaic (PV) arrays with total power of about 10 kW, 20 kW and 30 kW. The system is connected to distribution network via appropriate inverters. The basic goal is to determine reducing the bill for electric energy, as well as pollutant emission reduction in the case of the educational school (secondary school or faculty). Detailed economic analysis is carried out using "Life Cycling Costs (LCC)" method. The money saving is determined in the case of climate with "normal" conditions about solar radiation and temperature, measured in Belgrade. Typical meteorological year data were used by System Advisor Model (SAM) software tool. Results of the analysis show that photovoltaic power system is technically and economically viable because the payback time is quite acceptable. Also, the results are compared with results of similar earlier analysis of PV systems of 1 kW, 3 kW and 5 kW.

Keywords: Energy efficiency, Renewable energy source, Solar energy, Photovoltaic generator, System Advisor Model (SAM) software.

1. INTRODUCTION

On the today's degree of development renewable energy resources are unavoidable. Electricity production by renewable resources becomes much more important, due to several reasons. During several last years, efforts in Republic of Serbia to begin with distributed PV (and other) generation using are intensified. Main reasons for this are available hydro and solar resources, as well as tendencies in the world to reduce detrimental gasses emission.

Mathematical models of solar systems, as well as design and planning principles are presented in detail in several books [1-6] and many scientific papers. Owing to that, the methods for PV plants planning and design in Republic of Serbia are developing, as well as awareness about their technical and economic characteristics. The basic goal in this paper is to give some contribution in that sence.

Most commonly, the goals of solar systems installing on the educational institutions' roofs are social and economic. These projects commonly are intended to achieve next goals:

1. Determining the real potentials and possibilities to implement solar systems in Republic of Serbia,
2. Demonstration of ways of usage photovoltaic (PV) technology through practice education process,
3. Help to education institutions by electric energy bill saving, and
4. Promoting of the renewable energy sources usage, especially solar modules.

This paper analyzes three power systems (10 kW, 20 kW and 30 kW) for generating electricity for educational institutions, based on dynamic simulation. There are several adequate software tools for such analyses, as TRNSYS, System Advisor Model (SAM), and HOMER [7-9]. In this paper, System Advisor Model (SAM) software tool is used, because it is project-oriented. Also it contains high-fidelity models of elements, and comprises possibilities for detailed economic analysis. The PV model employed in System Advisor Model software is excellent De Soto's PV model described in detail in [9-10]. Also,

