

## **Solar-Assisted City Bus Electrical Installation: Opportunities and Impact on the Environment in Sydney**

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**Abstract :** On-board electricity consumption in the diesel city bus during operation is an important energy source. Electricity is generated by a combustion engine-driven alternator. Increased fuel consumption to generate on-board electricity in the bus has a negative impact on the emission of toxic components and carbon dioxide. At the same time, the bus roof surface allows placing a set of lightweight photovoltaic panels with power from 1 to 1.5 kW. The article presents an experimental study of electricity consumption of a city bus with diesel engine equipped with photovoltaic installation. The stream of electricity consumed by the bus and generated by a standard alternator and PV system was recorded. Base on the experimental research carried out in central Europe; the article analyses the impact of an additional source of electricity in the form of a photovoltaic installation on fuel consumption and emissions of toxic components of vehicles located in the latitude of Sydney. In Poland, the maximum global value of horizontal irradiation GHI is 1150 kWh/m<sup>2</sup>, while for Sydney 1652 kWh/m<sup>2</sup>. In addition, the profile of temperature and sunshine per year is different for these two different latitudes as presented in the article. Electricity generated directly from the sun powers the bus's electrical receivers. The photovoltaic system is able to replace 23% of annual electricity consumption, which at the same time will reduce 4% of fuel consumption and CO<sub>2</sub> reduction. Approximately 25% of the light is lost during vehicle traffic in Sydney latitude. The temperature losses of photovoltaic panels are comparable due to the cooling during vehicle motion. Acknowledgement: The project/research was financed in the framework of the project Lublin University of Technology - Regional Excellence Initiative, funded by the Polish Ministry of Science and Higher Education (contract no. 030/RID/2018/19).

**Keywords :** electric energy, photovoltaic system, fuel consumption, CO<sub>2</sub>

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