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# The PV LED Engine – a new generation of intelligent solar powered LED lighting

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***Abstract*— A barrier for exploiting use of standalone solar lighting for the urban environment seem to be lack of knowledge and lack of available tools for proper dimensioning and positioning. This work presents such a tool.**

***Keywords*— PV urban lighting, Energy systems, standalone, LED lighting, Light-2-Light**

## I. INTRODUCTION

Digging down cables for small electrical applications in the urban environment is extremely expensive due to the high labor cost associated with it. Small stand-alone PV applications powered by 0.5-50 Wp can become very attractive since e.g. in Copenhagen in Denmark the cost of digging down cables in the city is about 1000 $ pr. running meter so the cost savings on the cable digging can easily pay for the solar cells and electronics. The requirements to the products from the municipalities are high so if e.g. the products are for lighting purpose the reliability of the product meeting some specified amount of light is very important. The barrier for exploiting this potential seems to be the lack of knowledge and tools for dimensioning and designing PV applications for the urban environments. The authors investigated the many PV dimensioning tools on the market and found none addressing exactly this issue and in the present project a design and simulation tool for small PV applications for the urban environment has been developed along with characterization facilities able to characterize the individual components of the system: Solar panel, Battery, Electronics and LED/Luminaire.

## II. FIGURES AND TABLES

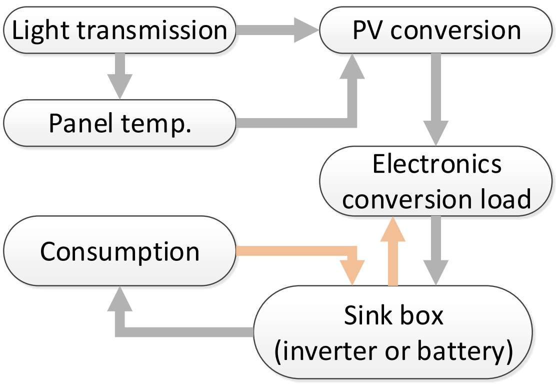


Fig. 1. Block diagram of the PV simulation tool.

Fig. 2. BIKE-LIGHT – solar lighting product for Copenhagen.

## III. SUMMARY

A time resolved dimensioning tool schematically shown in figure 1 is developed that uses measured parameters of the individual components in the PV Lighting system for the simulations: PV, Battery, Electronics and LED/Luminaire. The tool uses time resolved solar irradiation data (1 minutes – 60 minutes resolution) separated in diffuse and direct irradiation to calculate the dynamic energy harvesting of the solar panels in the product (eg. BIKE-LIGHT shown in figure 2). An attenuation function based on the measured or simulated shading environment of the product is used to simulate the energy harvesting. Due to the dynamic behavior with different irradiation levels of the PV and lighting levels of the LEDs both the energy harvesting and lighting scheme of the product is modelled time resolved and dynamically to achieve the most lifelike prediction of the product performance to be able to dimension the product perfectly for the given application.

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