**Please Reply to:**

Alessandro Trindade

Adjunct Professor

Universidade Federal do Amazonas

Departamento de Eletricidade

Av. Gal. Rodrigo Otávio, 3000, Japiim, Campus Universitário

ZIP 69077-000, Manaus – AM, Brazil

e-mail: [alessandrotrindade@ufam.edu.br](mailto:alessandrotrindade@ufam.edu.br)

Manaus, 5th May 2020

Badrul H. Chowdhury, Ph.D.

Editor-in-Chief

University of North Carolina at Charlotte

IEEE Transactions on Sustainable Energy

Please find enclosed a revised version of our manuscript entitled “Optimal Sizing of Stand-alone Solar PV Systems via Automated Formal Synthesis” by Alessandro Trindade from the Federal University of Amazonas (Brazil) and Lucas Cordeiro from The University of Manchester (UK), which we would like to (re)submit for publication in the IEEE Transactions on Sustainable Energy journal. This paper was originally submitted in September of 2019, and, based on the reviewer’s suggestion, we have improved this research considerably. From our point of view, our work is aligned with the scope of IEEE Transactions on Sustainable Energy journal: original research with a new methodology of design optimization for stand-alone solar photovoltaic systems.

Our manuscript describes and evaluates an automated formal synthesis optimization method for the sizing of stand-alone solar photovoltaic systems. It employs a software verifier and a program synthesis method to obtain the optimal sizing of the renewable energy system used in rural areas of developing countries or where grid extension is unfeasible.

Related studies in the optimization of PV systems are usually performed by simulation tools, which are well-known in the market. However, the exploration of all design-space is impossible with those tools. Some flaws (like oversizing) or incompleteness can be originated from the design phase, thereby reaching the field, after the PV deployment. This drawback can cause dissatisfaction to the PV system owners, and to the wrong conclusion that intermittent renewable systems are not good or reliable. We believe that we advance the state-of-the-art in this direction.

In our study, experimental results, from seven case studies, in a comparative evaluation of tools, showed that only the automated synthesis optimization could find detailed information for the PV systems and with the plus of working with a database of manufacturers and equipment that are available at the consumer market. We added validation of the optimal sizing with the PVsyst tool.

Finally, based on the fact that since 2015 papers are dealing with formal verification applied to electrical systems, with excellent results, but exclusively related to PV panels or grid-tied systems, our study is unique and complemented with real data from twelve months of use of four case studies. We put together mathematical models, automated verification, synthesis, simulation, empirical observation, and interviews from dwellers in remote communities of Amazon State in Brazil.

The authors claim that none of the material in the mentioned paper has been published or is under consideration for publication elsewhere. This paper is linked with the Ph.D. Thesis from the primary author, which was defended in January of 2020.

As a list of recommended reviewers, with related research and papers at the same theme, we can indicate:

* Professor Alessandro Abate, from the Department of Computer Science of the University of Oxford (contact: [aabate@cs.ox.ac.uk)](mailto:aabate@cs.ox.ac.uk)" \t "_blank)
* Enrico Tronci, from Dip.to di Informatica Università degli Studi di Roma, “La Sapienza”, Italy (contact: [tronci@di.uniroma1.it)](mailto:tronci@di.uniroma1.it)" \t "_blank)
* Mimmo Parente, from Dip.to Scienze Statististiche & Innovation Systems (DISA-MIS), Università degli Studi di Salerno, Italy (contact: [parente@unisa.it](mailto:parente@unisa.it))

Note that there exists no conflict of interest. All the funding and the support received ended in March of 2019.

Thank you for your time.

Sincerely,

