

PROFESSIONAL PAPERS ON CONFERENCES AND JOURNALS

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1. Summary

It is challenging to provide a low carbon energy supply in cities in a combination with energy storages. This is emphasized in historical urban centres because interventions in this specific area meet strict architectural protection constraints, involve higher implementation costs and often come in conflict with town planning policies.

International conferences and scientific journals are bringing opportunities for engineers, specialists in industry and academia to connect and create fora for sharing knowledge and exchanging experiences on recent developments, applications and future trends in all aspects of power electronic systems, distributed generation systems, energy storage systems, building energy systems, and their industrial applications. They allow us to present the concept of energy management in buildings and how it extends to historical urban centres (HUCs) to the wider audience consisting of scientists, engineers, and industrial specialists. The developed concepts are presented through online available papers and presentations at conferences.

2. Titles and types of publications

2.1. Cascaded control of back-to-back converter DC link voltage robust to grid parameters variation

- IEEE Transactions on Industrial Electronics (Volume: 68, Issue: 3, March 2021), Page(s): 1994 - 2004
- Journal publication
- <https://ieeexplore.ieee.org/document/8998535>

2.2. Optimal parameterization of a PV and a battery system add-on for a consumer

- 2020 IEEE 11th International Symposium on Power Electronics for Distributed Generation (IEEE PEDG 2020), Jun 8, 2020 - Jun 11, 2020. Dubrovnik, Croatia
- Conference publication
- <https://ieeexplore.ieee.org/abstract/document/9244462>

2.3. Predictive control and optimization procedures in energy management of buildings and infrastructure

- 35th International Conference on Electrical Drives and Power Electronics, 22.-24. 9. 2021., Dubrovnik, Croatia
- Conference publication
- https://www.edpe2021.fer.hr/s/EDPE2021_keynote_Vasak_final.pdf



2.4. Parameterization of a Photovoltaic and a Battery System Add-On for a Consumer Based on a Sequential Linear Program

- Engineering Power Vol. 16(3) 2021, bulletin of the Croatian Academy of Engineering, Page(s): 16 - 21
- professional journal paper
- <https://www.hatz.hr/en/engineering-power-e-p-vol-163-2021/>

3. Topics tackled and links to deliverables, outputs

3.1. Cascaded control of back-to-back converter DC link voltage robust to grid parameters variation

The publication documents the design of the control of the interfacing power converters between energy storages or renewable energy sources and weak grids since weak grids are often found in historical urban centres. It shows how the power converter control can be made more immune to such weak grids.

3.2. Optimal parameterization of a PV and a battery system add-on for a consumer

Photovoltaic systems are widespread renewable energy sources that can be installed at a variety of locations (private houses, residential or non-residential buildings, factories, warehouses...). Because of their sun dependence, they can provide more than enough energy during the day, but no energy during the night. Having a battery energy storage system can ensure that the surplus of energy is stored and used later to avoid selling the energy at a low price to the distribution system operators (DSO) of the grid and then purchasing the electricity from the grid at a higher price. Not only that a photovoltaic system in a combination with battery energy storage system reduces monthly electricity bills for a consumer, it also contributes to environmental protection in terms of reduced CO₂ emissions and increased usage of renewable energy sources. To maximize the contributions while minimizing the price of the installations, this publication introduces a procedure to find the optimal sizing parameters of a photovoltaic and of a battery energy storage system for a site.

The publication corresponds to the first iteration of the module 1 of the EMS tool. It is written on the basis of the deliverable D.T3.1.2. Designed adapted tools for energy management with energy storages in HUC.

3.3. Predictive control and optimization procedures in energy management of buildings and infrastructure

This publicly available presentation related to the plenary lecture of Prof. Mario Vašak on the 2021 International Conference on Electrical Drives and Power Electronics outlines versatile usages of mathematical optimization in energy management of buildings and infrastructure. Among other uses, the talk also covered the main results achieved with Module 1 and Module 2 of the Store4HUC tools.



3.4. Parameterization of a Photovoltaic and a Battery System Add-On for a Consumer Based on a Sequential Linear Program

This publication describes a procedure for optimal sizing of the investment in a renewable electricity source and electricity storage for a particular consumer with a known electricity consumption profile, under the given conditions of allowed return on investment periods and with the optimal operation of the battery storage system included. The optimal size of the PV system in terms of its power production under standard test conditions is provided, as well as the optimal size of the battery storage system in terms of its power converter power rating and the storage capacity.

The publication corresponds to the final iteration of the module 1 of the EMS tool. It is written on the basis of the deliverable D.T3.1.3. Finalized software tools for energy management in HUC.

4. Expected effects and follow up

The publications reached researchers from different universities and other research institutions and allowed us to present the work done through the project Store4HUC, by creating a forum for sharing knowledge and exchanging experiences on recent developments, applications and future trends.

The number of higher education and research entities reached with the published journal article is high - already at this moment the published journal article reached 500 full-text views and 1 paper citation. The paper “Optimal parameterization of a PV and a battery system add-on for a consumer” was presented at 2020 IEEE International Symposium on Power Electronics for Distributed Generation Systems (PEDG) conference which gathered more than 100 paper authors and experts in the field. Until now, the paper reached 50 full-text views and 2 paper citations. Both papers are listed in the [IEEEXplore](#) database.

It is expected that the papers will continue to increase in visibility and citations, and that the authors will continue their work upstared in the papers.