

OUTPUT FACT SHEET

Tools

Version 2

Project index number and acronym	CE1344 Store4HUC
Output number and title	O.T3.1 Finalized software tools for energy management in HUC validated through pilot activities
Responsible partner (PP name and number)	University of Zagreb Faculty of Electrical Engineering and Computing PP9
Project website	https://www.interreg-central.eu/Store4HUC
Delivery date	October 2021

Summary description of the key features of the tool (developed and/or implemented) and of its transnational added value

The tools address two major challenges incurred when it comes to the usage of renewable energy and energy storages in the context of HUCs and in general - how to parametrize the investment to gain best value from it and how to operate the system consisting of an energy source, energy storage and an energy consumer. The software tools developed address them in specific set-ups - Module 1 deals with parametrization of a PV system and a battery system as an add-on for a consumer while Module 2 deals with day-ahead scheduling of operation of a heat source connected to a heat storage.

Module 1 parametrizes the PV system in kWp, the corresponding battery storage capacity in kWh and the battery system power converter in kW. It is initiated by a certain pre-defined scaled yearly power consumption profile of a certain consumer type or the user can set his/her own profile. Different pricing set-ups corresponding to various Central Europe countries can be chosen as well as different other pricing/performance parameters.

Module 2 provides a day-ahead schedule of operation of a heat source connected to a heat storage. The user provides the presumed 24-h ahead profile of the heat power consumption from the storage and is provided with a suggestion how the heat source should be run to incur minimum operational costs.

Both modules 1 and 2 are developed in Python and equipped with a user interface in Excel through which the user can effectively interact with the tools and preview the obtained results. The Excel interfaces of both tools are available in English and also in Croatian, German, Italian and Slovenian. When it comes to Module 1, it also has built in the basic pricing contexts of Austria, Croatia, Germany, Italy and Slovenia. These features bring a significant transnational value to the tools.

The tools have been tested in different pilots' contexts - Module 1 in contexts of the Store4HUC pilots in Bračak and Cuneo while Module 2 in the contexts of the pilots in Weiz and Lendava.

NUTS region(s) where the tool has been developed and/or implemented (relevant NUTS level)

The tool has been developed in Croatia while partners from Austria, Germany, Italy and Slovenia have additionally provided their national contexts / pricing systems for Module 1. The translations for the Excel interface were additionally provided by partners from Austria, Italy and Slovenia such that both modules/tools are available in five languages - Croatian, English, German, Italian and Slovenian. The tools were implemented on pilots in Austria, Croatia, Italy and Slovenia.

Expected impact and benefits of the tool for the concerned territories and target groups

Module 1 helps investors or counselling stakeholders to optimally parametrize investments in a PV+battery system such that the economic viability is ensured within a pre-defined RoI period. This is to counteract the current situation where mostly just sole PV systems are planned without systematically exploring the potential benefit a battery energy storage could bring.

Module 2 helps the operators of heating systems with a heat storage, be it either in buildings or a part of a district heating system, to operate the heat sources more efficiently - the operator is suggested what is the optimal day-ahead schedule of the heat source operation such that minimum operational costs are incurred (minimum primary energy consumption). This is to counteract the current situation where only the reactive automation system is used to run the system. The user is made aware what improvement the optimal scheduling will make to a classical way of operation such that he/she can assess whether it is worth or not to follow the suggested schedule.

The tools have for now been demonstrated to stakeholders of different national deployment desks and have sparked a significant interest - e.g. in the Croatian deployment desk the cultural heritage conservation office representative has found Module 1 useful to get to know what is the cost of normal energy system upgrade without taking into account the historical urban context, in order to become aware what is the cost increase due to the specific HUC context addressing.

Different institutions manifest their interest in taking up the tools by signing the letter of intent and declared themselves to apply them.

Sustainability of the tool and its transferability to other territories and stakeholders

The tools are freely accessible for download through the official project web page and are accompanied with additional guidelines and video tutorials. The download links are leading to the locations on PP9 servers such that the tools will be further upgradeable based on feedback from stakeholders and new versions could be released without changing the official web page content, which will be frozen after the project end. A significant attention was put on the usability of the tools on computers of typical RAM sizes and processor speeds such that the tools can be broadly used.

There is no obstacle to use Module 2 also in other territories except Austria, Croatia, Germany, Italy and Slovenia, it is in no way tied exclusively to these territories. Module 1 has the pricing setups for electricity taken from the mentioned territories, but also it can be used in other territories with similar electricity pricing setups.

Except for investors and energy agencies in counselling role, also policy makers can use Module 1 to find out how different subsidy setups on renewable energy and energy storages can affect the optimal investment decisions which may guide the policy instruments setup.

Lessons learnt during the development process are that short video tutorials can be a driving force for approaching versatile stakeholders regarding the tools usage.

**References to relevant deliverables and web-links
If applicable, pictures or images to be provided as annex**

The main related project deliverable is D.T3.1.3 Finalized software tools for energy management in HUC where the tools are explained - both their mathematical background, the way they are used and the result of their application on various pilot sites. It is accessible through the Interreg project web page or directly through this link: <https://www.interreg-central.eu/Content.Node/Store4HUC/D.T3.1.3-Finalized-software-tools-final.pdf>. Both tools can be downloaded from the Interreg project web page also, in various languages (Croatian, English, German, Italian, Slovenian), from the Tools section of the project web page <https://www.interreg-central.eu/Store4HUC>.