CONCERTED ACTION
ENERGY PERFORMANCE
OF BUILDINGS

Cost-effective and Smart System Monitoring for Energy Performance Certificates

Authors: **Nada Marđetko Škoro, Ministry of Construction and Spatial Planning, Croatia**

Introduction

The quality of Energy Performance Certificates (EPCs) is central for ensuring a successful building energy performance certification scheme. With many different actors and assessors involved in the certification process, it can be difficult and costly to ensure high quality for every single certificate.

A cost-effective and smart quality system monitoring for EPCs is identified as an efficient and relatively cheap tool which can be integrated into an EPC database as well as implemented and used to enhance the quality of issued EPCs.

An optimal strategy would include a three-staged EPC control procedure, each with its own aims:

A. Administrative and automated control

Cost-effectiveness and smartness are achieved by automated checks on specific parameters, e.g, major technical aspects and regulatory definitions. Smartness is necessary to assure that no EPC is accepted in the database without complying to a specific range of such values. The aim it to perform administrative and automated checks on specific elements for every EPC to diminish the possibility of issuing a faulty EPC and improve safety and reliability of the EPC system.

B. In-depth quality control

More in-depth quality check schemes include calculation checks which are costlier and require a continuous flow of funding as well as technical expertise. The intention is to perform in-depth quality control only in cases filtered out during the first stage of control, but also on a representative statistical sample of EPCs issued yearly. Examples should serve to further improve energy assessors' and engineers' skills.

C. On-site data check

Site inspections are performed for the EPCs most poorly produced as a result of misinterpretation of data or severe manipulation of inputs in the calculation tool and/or monitoring system. The aim of on-site data checks is to perform full data collection and calculations to determine the true energy performance and implement penalties to assessors for malperformance if severe mistakes are found.

Funding of the control system is often achieved through EPC registration fees as well as imposed fines. Also, initial funds for developing such a system are required; however, operation costs are low. in this way, funds are available for in-depth quality control (see B above) when expert knowledge needs to be utilised in the case of specific calculations if administrative and automated controls indicate faulty results (see A above).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 692447.

The EPC monitoring system in Portugal

In Portugal, there is a central registry in place that collects all the information used by the expert in order to issue the EPC. Each expert has access to a set of functionalities, which allows for the management of the whole EPC issuing process, including payments, EPC updates, historical data, etc.

Information is submitted by qualified experts to the central registry in the following sections: location of a building, building identification, envelope, windows, ventilation, technical systems, energy balance, and building documentation.

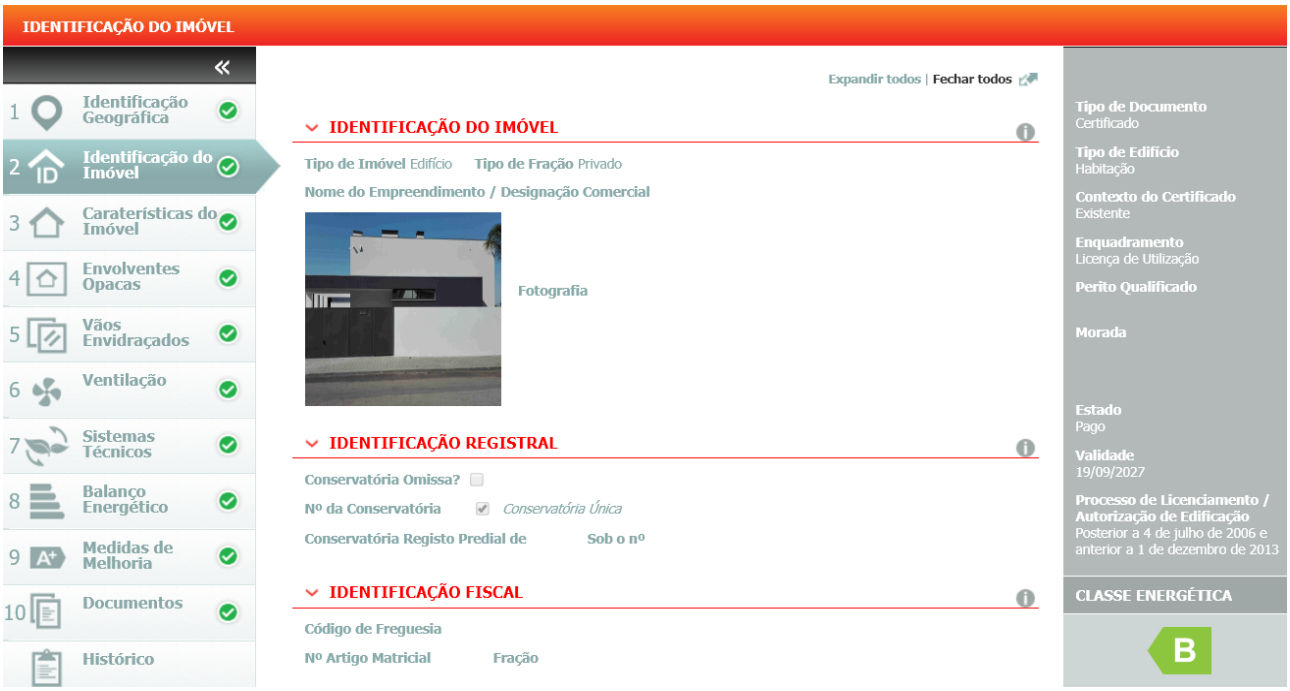

Figure 1. EPC central registry in Portugal.

There are 1.3 million EPCs in the Portuguese registry. Not all public buildings are yet recorded and there is no information available to estimate when this may happen. The EPC is an instrument used in national subsidy programmes for the energy refurbishment of buildings.

The EPC monitoring system in Slovenia

The Slovenian central registry is maintained by the Ministry of Infrastructure. It consists of a four-step online form and a public database. Input is simplified by an XML file exported from the EPC software where other building data is inputted as well. In the last step, the assessor digitally signs the document and the EPC is issued and becomes publicly visible in the buildings' database.

One of the first entries, provided by the expert, is the identification number (GIS) of a building. Then, the X and Y coordinates of the building are imported through the XML file from the EPC calculation software.

The comparison of these two entries, which both represent the precise location of the building, is the first check performed by the registry to ensure that the EPC is issued for the correct building.

The central registry also contains registries for air-conditioning (AC) systems, heating systems and energy management. The EPC is an instrument used in some national subsidy programs; still, it is not yet widely accepted.

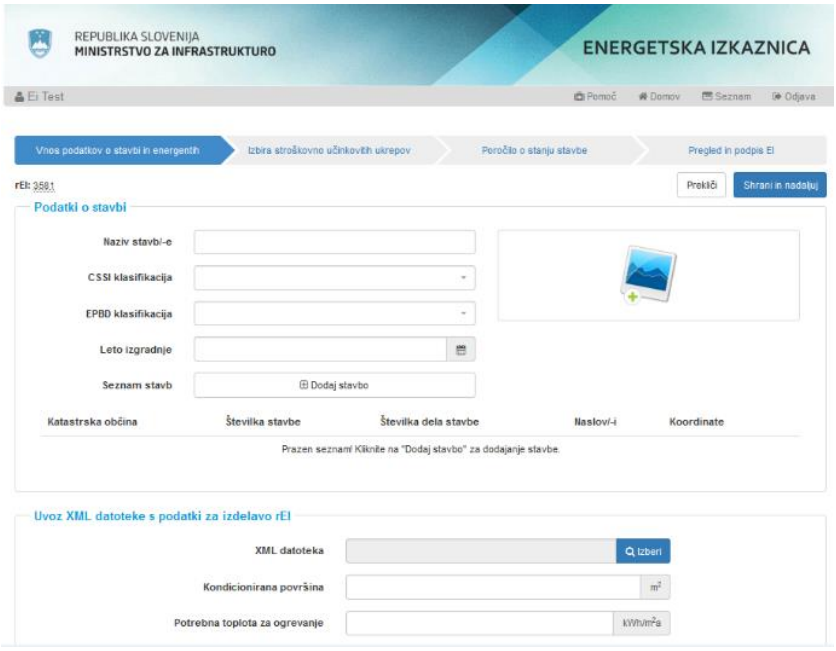

Figure 2. Slovenian EPC registry input page (first step): building info + XML input.

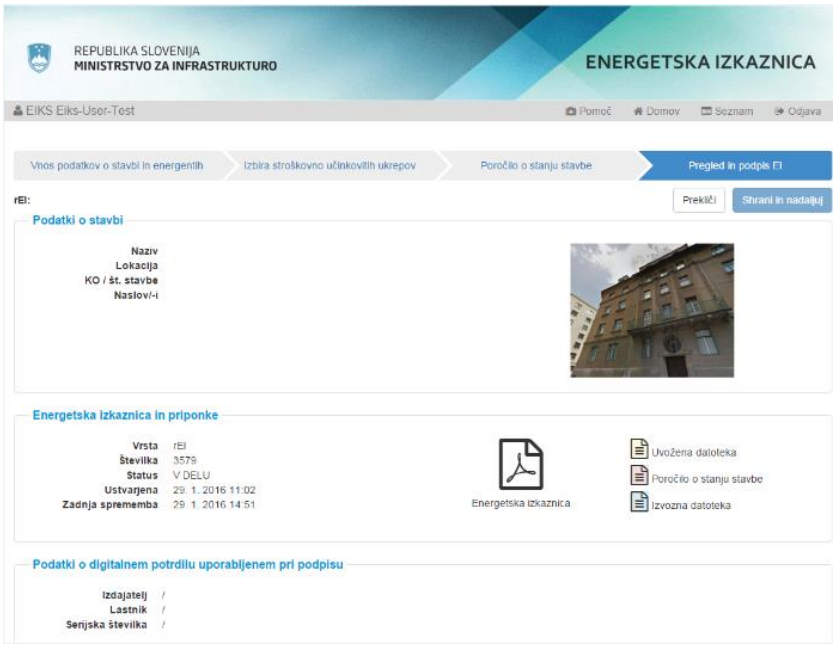

Figure 3. Slovenian EPC registry input page (last step): Overview + digital signature.

The EPC monitoring system in Croatia

The Croatian central registry for energy performance certificates - IEC (Energetski certfikat) was launched in October 2017 by the Ministry of Physical Planning and Construction. The application has been developed to manage five areas of the EPC framework: the EPC registry, the heating and AC systems registry, the independent EPC control system, the list of training institutions and the list of authorised energy assessors. User access is enabled by electronic authentication, subject to the specific area of their competence as authorised by the Ministry. There are more than 166,000 EPCs in the central registry.

EPCs are being produced through the EPC registry and authorised energy assessors enter data directly into the system. The data import for calculated energy performance indicators, as well as for building elements and systems is enabled via an XML file from the energy performance calculation software. To finalise the entries, energy efficiency measures are entered, and an energy audit report file is uploaded. Finally, the EPC document is issued by the IEC application. Additional development of this application will enable public access for every citizen so that basic information on every EPC can be readily viewed in the IEC registry.

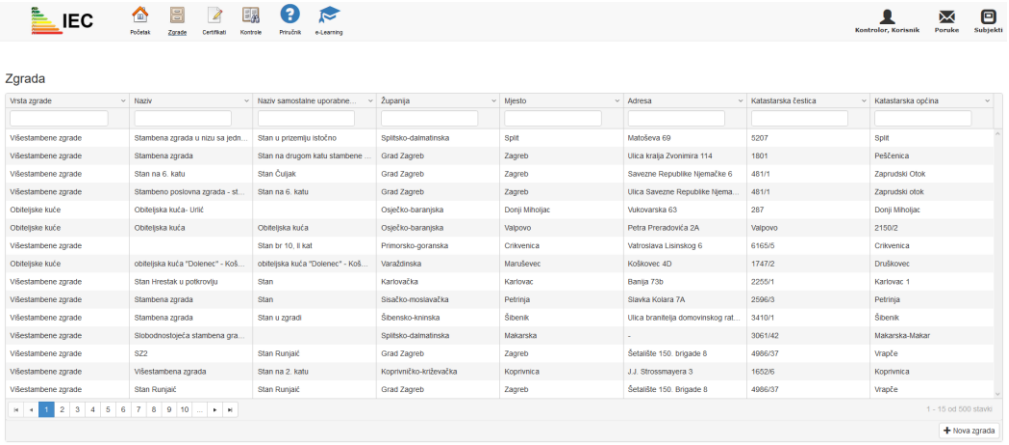

Figure 4. Croatian EPC central registry, IEC.

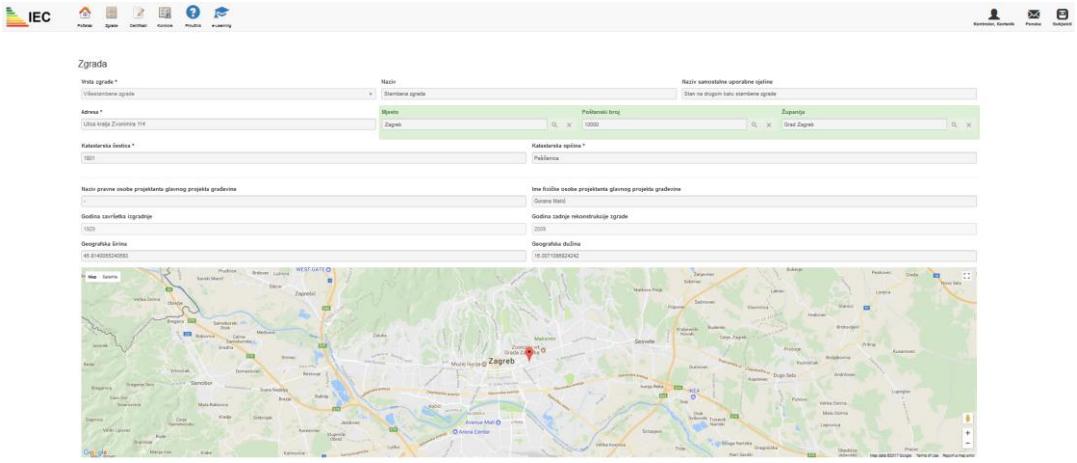

Figure 5. Layout for the data input to produce an EPC

EPCs are currently being used in the national energy refurbishment programmes of buildings to define current performance indicators and to verify savings achieved, as an EPC is required before and after the implementation of energy efficiency measures.

In parallel, an energy management system for public buildings (ISGE) is being implemented according to the Energy Efficiency Act (OG 127/14) by the Agency for Legal Market and Real Estate Procurement (APN), which is a part of the ministry. The ISGE application contains data on more than 13,500 public buildings, and its main purpose is to track and store data on energy consumption based on energy bills and/or distant metering points (available in some locations), as well as to define actual energy consumption indicators. This information can track excessive energy and water consumption and indicate corrective actions to reduce energy and water costs. Furthermore, the application is used to identify promising energy refurbishment projects within the national refurbishment programme. After the project is implemented, the Energy Service Company (ESCO) and the beneficiary can use it to monitor savings. Additional features of the application will include both a public lighting module and an energy refurbishment module for public buildings.

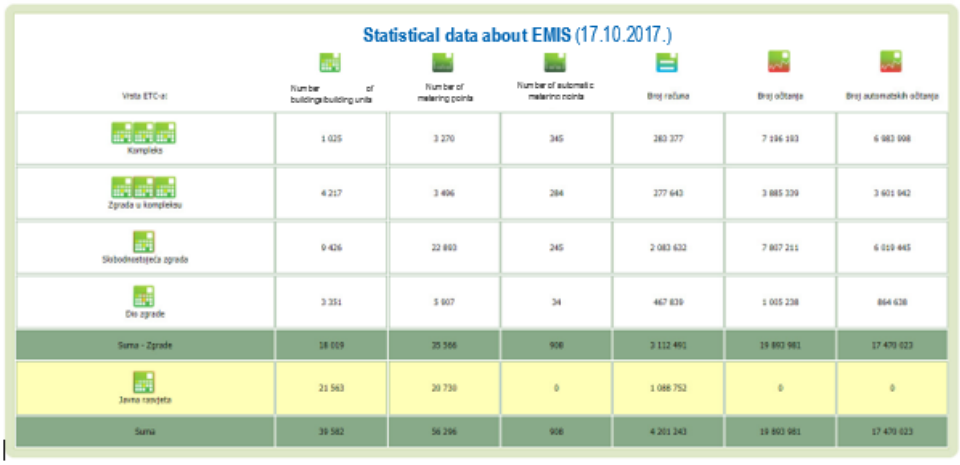

Figure 6. Statistical data on the energy management system for public buildings in Croatia

Conclusion

Most Member States (MS) consider sanctions to be an essential enforcement strategy so that reliable EPC information is consistently provided to final users. Besides having compliance and sanctioning systems on paper, a smart monitoring system should be used as a tool for the active enforcement of these tasks in practice. It is important to develop enforcement systems as an integral part of the legislation. If, however, checks and penalties are developed independently, this can lead to a system difficult to enforce, and confusion over roles and responsibilities can emerge. Efficient enforcement is achieved by using smart and cost-effective quality control systems integrated into the EPC database. Controls have been found to be more efficient and effective if a single entity is responsible for databases, assessor accreditation and the control system. Most notably, checks on data and calculations can be carried out automatically and done for every EPC submitted. The current penalty system has not made the desired impact on compliance nor has it achieved an improvement in EPC quality. Sanctions of more than 1,000 € were found to be difficult to enforce, and some MSs reported that enforcement was not cost-effective for smaller amounts.

The integration of the EPC database into other public data sources is the next step; therefore, a reliable EPC document should be provided through the control and monitoring system

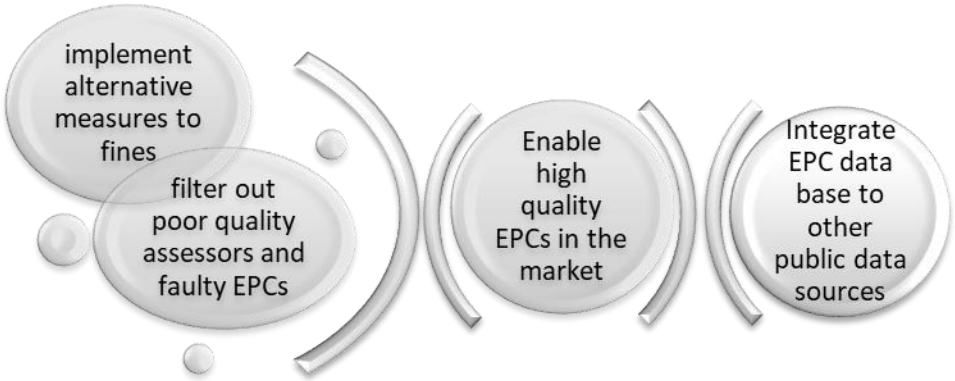

Figure 7. Steps in the development of a cost-effective and smart system monitoring for EPCs.

Special thanks for the inputs contributed go to:

Marjana Šijanec Zavrl, Building and Civil Engineering Institute ZRMK, Slovenia, marjana.sijanec@gi-zrmk.si

Pedro Mateus Agência para a Energia ADENE, Portugal, pedro.mateus@adene.pt