Integrating Smart Readiness into Energy Performance Certification: A Unified Approach for Sustainable and Digitalized Buildings

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Traditionally, EPCs have focused on energy efficiency, providing insights into a building's consumption patterns and compliance with sustainability targets. However, with the rise of digitalization and smart technologies, a more comprehensive evaluation is needed to reflect the evolving role of buildings in the energy system. The Smart Readiness Indicator (SRI), introduced by the European Commission, assesses a building's capability to integrate and leverage smart technologies to optimize energy use, interact with the grid, and enhance occupant comfort.

The SmarterEPC project aims to bridge the gap between energy efficiency and smart readiness assessments by proposing a joint EPC-SRI certificate. This approach ensures that building owners, policymakers, and professionals can access a single, standardized document that provides a holistic overview of a building's energy and smart performance. As the Energy Performance of Buildings Directive (EPBD IV) emphasizes the role of smart technologies in achieving EU climate targets, the integration of SRI into EPCs aligns with the European Green Deal's objectives. By combining these assessments, the joint certificate offers practical value to building professionals, investors, and regulatory bodies, enabling better decision-making for energy-efficient and future-proof buildings.

This article presents the concept, and structure of a joint EPC-SRI certificate, highlighting how SmarterEPC contributes to the ongoing evolution of energy performance assessments in Europe. The proposed approach aims to enhance transparency, usability, and compliance with EU policies, ensuring that the building sector accelerates its transition to sustainability and digitalization.

Energy Performance Certificates Under the EPBD Recast: Mandatory and Optional Elements

The EPBD recast (Directive (EU) 2024/1275) establishes a harmonized and comprehensive framework for Energy Performance Certificates (EPCs) to improve transparency, comparability, and usability across Member States. The updated requirements in Annex V ensure that EPCs provide essential and actionable information on a building's energy efficiency, environmental impact, and smart capabilities, making them a key instrument in the EU's energy transition. At a minimum, EPCs must display the energy performance class, assigned on a harmonized A-G scale, where A represents zero-emission buildings, and G corresponds to the least efficient buildings in the national stock. The document must also include calculated annual primary and final energy use, measured in kWh per square meter per year, as well as the percentage ▶

Integrated Energy Performance and Smart Readiness Certificate

Building ID
University1

Date of Assessment
24-10-2024

Assesor Name
Theoklitos Klitou

Building Type
Non Residential

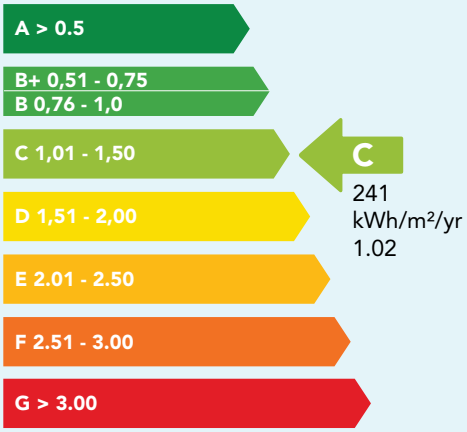
Building Usage
Educational

Location
Nicosia, Cyprus

Net Floor Area
20000m²

Year of Construction
2003

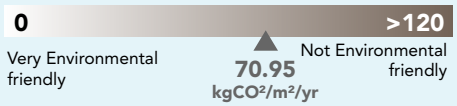
Building Energy Rating kWh/m²/yr



Reference values

• Minimum energy performance requirements	B
• Minimum energy performance standards	A
• Nearly zero-energy building requirements	A
• Zero-emission building requirements	A

Carbon Dioxide (CO^2) Emissions Indicator $kgCO^2/m$ /yr

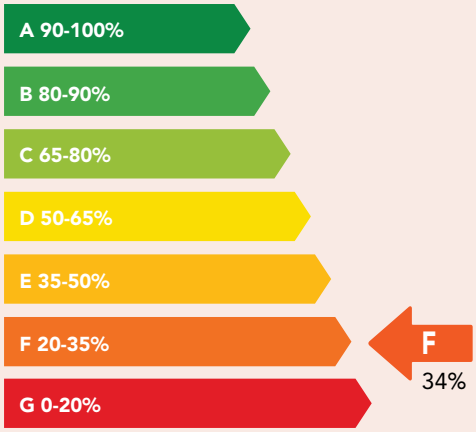


Greenhouse gas emission class:
D

Energy Use and Renewable Production

Calculated annual primary energy use in kWh/(m²y)	241
Calculated annual final energy use in kWh/(m²y)	241
Metered energy use kWh/(m²y)	310
Renewable energy produced on-site in %	0

Smart Readiness Indicator %



Optimize Energy Efficiency and Performance
36%

Adapt to Occupant Needs
49%

Adapt to Signals from the Grid
17%

Smart Readiness Impact Criteria

Energy Efficiency	38%
Energy Flexibility and Storage	17%
Comfort	33%
Convenience	30%
Health, Well-being & Accessibility	80%
Maintenance and Fault Prediction	34%
Information to Occupants	51%

Energy Use, Production, and System Features Overview

Calculated annual primary energy use MWh/year	5,000
Calculated final energy use MWh/year	4,800
Renewable energy production (kWh)/year	0
Main energy carrier and type of renewable energy source	N/A
Calculated energy needs in kWh/(m²y)	241
React to external signals and adjust the energy use	Yes/**No**
Heat distribution system is capable to work at low or more efficient temperature levels	Yes/**No**
Renovation passport is available	Yes/**No**
Digital Building Logbook is available	Yes/**No**

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Building Envelope and Systems

Average U-value for the opaque elements (W/m²K)	2
Average U-value for the transparent elements (W/m²K)	1.5
Type of transparent elements	Double-glazed window
Number of recharging points for electric vehicles	0
Type of recharging points for electric vehicles	N/A
Energy storage systems	Yes / No
Type of energy storage systems	N/A
Size of energy storage systems (kWh)	0
Sensors that monitor the indoor environmental quality	Yes / No
Controls that respond to the levels of indoor environmental quality	Yes / No

Smart Readiness Technical Domain

Heating	38%
Domestic Hot Water	50%
Cooling	32%
Ventilation	N/A
Lighting	42%
Dynamic Envelope	N/A
Electricity	19%
Electric Vehicle Charging	N/A
Monitoring and Control	21%

Operational Energy Metrics

	Heating	Cooling	DHW	Ventilation	Lighting
Energy use (kWh/m²/year)	125	20	15	60	30
Peak load (kW)	2500	800	200	500	300
Energy carrier	Natural Gas/ Electricity	Electricity	Electricity	Electricity	Electricity

Detailed Smart Readiness Technical Domain and Impact Criterion Scores

	Energy Efficiency	Energy Flexibility & Storage	Comfort	Convenience	Health, Well-being & Accessibility	Maintenence & Fault Prediction	Information to Occupants	SRI
Total	38%	17%	33%	30%	80%	34%	51%	34%
Heating	38 %	20%	33%	50%	100%	25%	67%	
DHW	67 %	40%	0%	40%	0%	50%	67%	
Cooling	38 %	17%	29%	29%	37%	25%	67%	
Ventilation	-	-	-	-	-	-	-	
Lighting	33 %	0%	50%	50%	0%	0%	0%	
DE	-	-	-	-	-	-	-	
Electricity	40 %	0%	0%	0%	0%	33%	44%	
EV	-	-	-	-	-	-	-	
M&C	25%	0%	0%	29%	0%	50%	33%	

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- of renewable energy produced on-site, indicating the level of reliance on clean energy sources. Furthermore, EPCs must report operational greenhouse gas emissions, expressed in kg CO_2 per square meter per year, while the life-cycle Global Warming Potential (GWP) must be included where data is available. In addition to these core indicators, EPCs must display energy needs, system efficiency, and responsiveness to external energy signals. A yes/no indication must specify whether a building has the capacity to adjust its energy use dynamically and whether the heat distribution system is capable of operating at efficient temperatures. The EPC must also provide information on the main energy carrier and include the contact details of one-stop-shop renovation advisory services, offering building owners access to guidance on energy upgrades and financial incentives.

Beyond the mandatory indicators, the EPBD recast allows Member States to include additional elements in EPCs to provide a more detailed and tailored assessment of building performance. These optional indicators enhance the practicality of the certificate, offering deeper insights into energy efficiency, environmental impact, and smart building features. One key addition is the greenhouse gas emission class, which categorizes a building's carbon footprint more clearly. EPCs may also include energy use and peak load data for heating, cooling, ventilation, and domestic hot water systems, as well as details on energy storage systems, recharging points for electric vehicles, and carbon removals linked to construction materials. The presence of indoor environmental quality sensors and smart control systems can also be reported, highlighting a building's digital readiness and occupant well-being. Additionally, EPCs can indicate whether a renovation passport or a Digital Building Logbook is available, offering long-term planning tools for improving energy performance and supporting a data-driven approach to sustainable building management

Content of the Smart Readiness Indicator Certificate Under Regulation (EU) 2020/2155

The Smart Readiness Indicator (SRI) certificate, as defined in Regulation (EU) 2020/2155, provides a structured assessment of a building's digital capabilities, focusing on its automation, control, and adaptability. This certificate conveys key information to building owners, professionals, and policymakers, ensuring a standardized evaluation of smart functionalities in the built environment. Each certificate contains a unique identifier, along with the date of issue and expiry, ensuring traceability and validity. It includes a descriptive section clarifying its scope, particularly in relation to the Energy Performance Certificate (EPC), helping users understand how smart readiness complements energy efficiency. General information about the building or building unit is recorded, including its type, surface area, year of construction or renovation, and location. If available, the energy performance class from a valid EPC is included to provide a broader perspective on both energy and smart readiness. A key feature of the certificate is the smart readiness classification, summarizing the building's overall digital and automation capabilities. This classification may be supplemented by the total smart readiness score, as well as detailed scores across the three key functionalities outlined in Annex I of the regulation: energy efficiency, responsiveness to user needs, and interaction with the energy grid.

Further breakdowns include individual scores per impact criterion, which can optionally be expanded to display technical domain-specific scores for greater granularity. Where possible, the certificate also includes details on connectivity infrastructure, such as high-speed internet readiness, and information on cybersecurity, interoperability, and data protection standards. An important clarification states that the certificate reflects the smart readiness level at the time of issuance, and any modifications to the building's systems would necessitate an update of the assessment. Where applicable, the certificate may also provide recommendations for improving smart readiness, taking into account factors such as heritage value. Finally, the certificate can include additional methodological details, such as assumptions and weighting factors used in scoring calculations, ensuring transparency in the evaluation process. This structured approach makes the SRI certificate a critical tool for advancing smart building technologies, supporting EU policies on digitalization, energy efficiency, and sustainable infrastructure.

Design of the Integrated EPC-SRI Certificate

The need for a joint EPC-SRI certificate arises from the increasing role of digitalization and smart technologies in achieving energy efficiency and climate neutrality in the building sector. While the Energy Performance Certificate (EPC) has long been the primary tool for assessing energy consumption, efficiency, and emissions, it does not account for a building's ability to optimize energy use, interact with the grid, or improve user comfort through smart technologies. Conversely, the Smart Readiness Indicator (SRI) evaluates a building's digital adaptability, but

it lacks integration with quantitative energy performance metrics that are essential for compliance with the Energy Performance of Buildings Directive (EPBD) and investment decisions.

A separate evaluation of EPC and SRI leads to fragmented assessments, administrative duplication, and missed synergies between energy efficiency and smart functionalities. This separation makes it difficult for policymakers, building professionals, and property owners to understand how digital solutions can enhance energy performance and vice versa. By integrating EPC and SRI into a single, streamlined certificate, the assessment process becomes more efficient, user-friendly, and actionable, ensuring that energy efficiency and smart capabilities are evaluated together rather than in isolation. A joint certificate also improves regulatory compliance by aligning with the EPBD recast, which increasingly emphasizes smart-ready buildings as part of the EU's decarbonization strategy. It provides a completer and more transparent dataset for national authorities, ensuring that Member States can track both energy efficiency improvements and the deployment of smart solutions in buildings. Additionally, for building owners and investors, having a single certificate simplifies decision-making by presenting both energy and smart performance in a unified format, making it easier to assess the potential value, sustainability, and future-proofing of a property.

The integrated EPC-SRI certificate is structured into two main sections: the first page presents the mandatory elements, ensuring compliance with EPBD IV and SRI regulation requirements, while the second page includes non-mandatory but relevant indicators, offering additional insights that enhance decision-making.

- On the first page, the energy performance class is prominently displayed using the standardized A-G scale, accompanied by calculated annual primary and final energy consumption in kWh/(m²·y). The percentage of on-site renewable energy production is also included, reflecting the contribution of clean energy sources. Additionally, operational greenhouse gas emissions ($kgCO_2/(m^2 \cdot y)$) are reported, alongside the life-cycle Global Warming Potential (GWP) where available. The smart readiness class is presented next to the EPC score, establishing a direct connection between energy efficiency and digital capabilities. This page provides the core regulatory metrics required for compliance and comparability across EU Member States.
- The second page contains optional elements, allowing for a more detailed analysis of the building's smart features, environmental impact, and system efficiency. Here, the smart readiness score per key functionality is displayed, breaking down the building's ability to optimize energy use, respond to user needs, and interact with the grid. Additional indicators, such as connectivity infrastructure, interoperability, and cybersecurity considerations, may be included where data is available. This section also allows for detailed information on technical domains, indoor air quality sensors, electric vehicle charging infrastructure, and energy storage systems. Where applicable, recommendations for improving both energy efficiency and smart readiness are outlined, helping building owners and professionals plan strategic upgrades.

Advancing Building Performance Through Integration

The integration of the Energy Performance Certificate (EPC) and the Smart Readiness Indicator (SRI) represents a major step forward in how buildings are assessed, ensuring a more holistic, data-driven approach to energy performance and digitalization. This structured and standardized approach simplifies regulatory compliance, improves comparability across Member States, and provides building owners, investors, and professionals with a single, comprehensive tool to guide renovations and investments. The modular design ensures flexibility for national adaptations while maintaining harmonized core elements in line with EPBD IV and SRI regulations. By bridging the gap between energy efficiency and smart functionalities, the joint EPC-SRI certificate promotes the adoption of intelligent technologies, making buildings more resilient, efficient, and future-ready. This integration marks a crucial milestone in the transition toward a more sustainable and digitalized European building stock, fully supporting the EU's climate and energy objectives.

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