

Deliverable 4.8

# **Training activities for Training Scenario 6 – Operational optimisation of building energy performance based on activities during EPC generation**

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## Executive summary

This report summarises the training activities carried out as part of the Task 4.8 “Training Scenario 6 - Operational optimisation of building energy performance based on activities during EPC generation”, one of the six scenarios included in Work Package 4 “EPC Standardisation, Training and Capacity Building”. The purpose of these activities is to disseminate the TIMEPAC vision for future scenarios of enhanced Energy Performance Certification (EPC) developed in the [Transversal Deployment Scenarios](#) carried out in TIMEPAC Work Package 2.

The recently approved recast of the Energy Performance of Buildings Directive (EPBD) underscores the critical importance of on-site visits in producing accurate and reliable Energy Performance Certificates (EPCs). The training activities included a two-hour webinar and a two-day in-class training in Slovenia and one-day training in Cyprus. The online webinar, held on March 23, 2024, titled [“Operational optimisation of building energy performance based on activities during EPC generation”](#), explored how to combine the on-site visit with re-commissioning (Re-Co) activities and to trigger operational optimisation of building energy performance. The goal was to empower participants with the necessary knowledge and skills to provide cost-effective optimisation recommendations for improving the energy performance of buildings based on activities during EPC generation. Additionally, the in-class training sessions on May 28 and 29, 2024, at Jožef Stefan Institute in [Ljubljana](#), Slovenia, and on September 23, 2024, at Cyprus Energy Agency in [Nicosia](#), Cyprus, provided hands-on experience and in-depth training on operational optimisation of building energy performance based on activities during EPC generation.

The engagement was notably high, with the online session attracting 199 registered participants and 132 attending live, reflecting the strong interest of the target audience, mostly experts involved in certification in professional practice and administration. The in-class sessions in Slovenia gathered 30 professionals from various backgrounds, enhancing cross-sector collaboration. Feedback from participants was positive, with high satisfaction ratings for both the content and delivery of the training sessions. The exploitation of synergies between energy performance certification, technical system inspections, and energy auditing aimed to provide solid recommendations for improving the energy performance of buildings. The training also included practical insights and experiences how Re-Co activities can be aligned with the SRI auditing and TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating. Additionally, the in-class training at Cyprus Energy Agency attracted 13 professionals from various backgrounds, enhancing cross-sector collaboration, and a motivational workshop at Cyprus University of Technology attracted 12 participants.

The training activities have successfully disseminated critical knowledge and fostered a collaborative environment among key stakeholders, who also communicated their interest in future webinars and courses. Most of the participants expressed considerable notice in the practical application of the training insights in their professional activities. Overall, the training activities were well-received, meeting the learning needs of the participants and contributing to the advancement of EPBD objectives through accurate and easy-to-use data analysis methods.

The positive feedback and high engagement levels underscore the importance and effectiveness of these training efforts.

# 1 Introduction

## 1.1 Purpose and target group

The purpose of Task 4.8 “Training Scenario 6 - Operational optimisation of building energy performance based on activities during EPC generation” was to deliver the results of the Transversal Deployment Scenarios (TDSs) through training activities to a wide audience, focusing on professionals and stakeholders involved in building performance assessment, energy efficiency, urban planning, and policy-making.

In particular, the training focused on uncovering how to integrate various activities such as EPC generation, energy auditing, and Re-Co, and on providing solid recommendations for improving the energy performance of buildings. This approach demonstrates the usefulness of combining activities during the process of EPC generation. In practice, this means that in order to be cost-effective, the energy-performance assessments should be combined with energy auditing, Re-Co, SRI and sustainability rating. Training Scenario 6 delivers the results of Task 2.4 [“TDS 4 - Integration of Smart Readiness Indicator \(SRI\) and sustainability indicators in the EPC”](#); in addition, part of the outcomes of Task 2.2 [“TDS 2 - Enhancing EPC schemas through operational data integration”](#) and Task 2.3 [“TDS 3 - Creating building renovation passports from data repositories”](#) are also considered.

The target group encompasses experts from various sectors involved in energy performance certification, including:

- Public bodies at municipal, regional, and national levels,
- Private sector entities including energy consultancies and auditing,
- Academic institutions and research centres

The purpose of the training is to equip stakeholders with the knowledge and skills necessary to comply with regulations, adopt sustainable practices, apply accurate methods, and contribute to energy-efficient urban development, in line with the recent recast of the Energy Performance Building Directive (EPBD).

## 1.2 Deliverable structure

The present deliverable is structured in the following sections:

- Section 2, “Online training activity”, provides a comprehensive overview of the webinar conducted on March 22, 2024.
- Section 3, “In-class training activity in Slovenia”, offers a thorough account of the training sessions held on May 28 and 29, 2024.
- Section 4, “In-class training activity in Cyprus”, offers a thorough account of the training sessions held on September 23, 2024.
- Section 5, “Conclusion”, presents insights drawn from the training activities.

## 1.3 Contribution of partners

JSI led Task 4.8 and organised the training activities, on-line and in-class in Ljubljana. Cyprus Energy Agency (CEA) and Cyprus University of Technology (CUT) organised in-class training in Nicosia and a motivational workshop in Limassol. The invitation to stakeholders to participate in the training was managed by JSI in collaboration with the Goriska Local Energy Agency (GOLEA), Ministry of Environment, Climate and Energy (MOPE), CEA, and CUT.

## **1.4 Relations to other project activities**

The outputs of the Transversal Deployment Scenarios carried out in WP2 were presented in the training activities organised within this task. The activities have been disseminated through the project website, [TIMEPAC Academy](#) platform, and TIMEPAC's social media channels.

## 2 On-line training activity

### 2.1 Introduction

On March 22, 2024, the webinar titled ["Operational optimisation of building energy performance based on activities during EPC generation"](#) addressed the topic of exploring the synergies between energy performance certification and Re-Commissioning (Re-Co) for achieving a decarbonised building stock by 2050, as outlined in the recast Energy Performance of Buildings Directive (EPBD), by showing an effective methodology to perform operational optimisation of building energy performance based on activities during EPC generation and to enable the identification of tailored and building-specific energy-efficiency and flexibility measures (Figure 1). This was an international event organised in cooperation with Slovenian (JSI, GOLEA, MOPE) and Italian (POLITO) TIMEPAC partners.

**TIMEPAC Academy** academy.timepac.eu

Webinar series

### 6. Operational optimisation of building energy performance based on activities during EPC generation

**Aimed at:** certifiers, energy auditors, architects, engineers, energy managers and facility managers

**Contact:** boris.sucic@jsi.si

The new EPBD recast aims to increase the rate of renovations of energy-inefficient buildings and improve information on energy performance. Member States shall ensure that energy performance certificates (EPCs) are affordable and issued by independent experts following an on-site visit.

In the context of the TIMEPAC project, on-site visit is essential element of the EPC generation process and must be properly planned. During the on-site visit, the certifier should visually inspect the condition of the equipment, systems, and living/working spaces. During this webinar, we will explore how to combine the on-site visit with re-commissioning activities. Our goal is to empower participants with the necessary knowledge and skills to provide cost-effective optimization advice based on activities during EPC generation. Re-commissioning (Re-Co) is the expression used to describe an energy-system operation-optimization service in existing buildings. It focuses on improving the overall performance of a building by investigating and improving how systems operate together. It consists of a rapid energy audit of the buildings, focused on a check and re-set of the energy system's operating parameters. Even though they might give rise to some additional costs, Re-Co services can be carried out successfully and be a cost-effective part of the EPC-generation process because they will generate additional benefits for the owners and building users. The webinar will also provide insights into the monitoring and targeting techniques and comparing the existing with the expected performance.

**Programme** Friday, 22 March 10:00 - 12:00 CET

- Welcome  
Stane Merše (JSI)
- Re-Commissioning: Creating awareness and common understanding  
Marko Pečkaj (JSI)
- Distinguishing Re-Co energy audit and retrofits  
Boris Sučić (JSI)
- Re-Co in the building life cycle  
Gašper Stegnar (JSI)
- Re-Co and EPC  
Gašper Stegnar (JSI)
- Planning Re-Co activities  
Marko Pečkaj (JSI)
- Re-Co and BACS  
Boris Sučić (JSI)
- Re-Co and HVAC  
Vincenzo Corrado (POLITO)
- Re-Co and electrical lighting  
Matej Pahor (GOLEA)
- Discussion and closing remarks  
Boris Sučić (JSI)

**Organizers** Jozef Stefan Institute, Ljubljana, Slovenia Politecnico di Torino

The consortium has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 101033819 as part of the call "LC-SC3-B4E-4-2020 - Next-generation of Energy Performance Assessment and Certification".

Figure 1. Announcement of the webinar on the TIMEPAC Academy website

The webinar's objective was to empower participants with the necessary knowledge and skills to provide cost-effective optimisation recommendations for improving the energy performance of buildings based on activities during EPC generation. It explained how to combine the on-site visit with Re-Co activities and delved into practical strategies for improving the overall performance of a building by investigating and improving how systems operate together. This information was complemented with insights into the monitoring and targeting techniques and a comparison of the actual performance with the expected outcomes. The webinar provided insights into the ["TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating"](#), focusing on the common goals of Re-Co and SRI auditing. The sessions covered key elements of proper planning and site visits, raising awareness and fostering a common understanding of Re-Co activities, distinguishing them from



energy audits and retrofits. They also provided tips for efficient EPC data collection, validation, and exploitation, highlighted the role of Re-Co in the building life cycle, and discussed data extraction from multiple sources. Additionally, the sessions explored the connection between Re-Co, EPC, and SRI, as well as the benefits of Re-Co in relation to the inspection of HVAC, BACS, and electrical lighting systems. Presenters emphasised that, although re-commissioning activities might incur additional costs, Re-Co services can still be successfully implemented as a cost-effective part of the EPC-generation process, as they provide additional benefits to building owners and users.

The webinar attracted a substantial audience, with 199 participants registered on the TIMEPAC Academy website and 132 attendees connecting to the live. Participants included professionals and stakeholders involved in building performance assessment, energy efficiency, facility management, energy management and policy-making.

## **2.2 Structure and content**

The webinar included the following sessions:

### **Session 1: Re-Commissioning: Creating Awareness and Common Understanding**

Re-Co is the process of re-optimising existing buildings that have already been commissioned. It aims to ensure that building equipment and systems operate at their best to meet the current needs of occupants. This session aimed to raise awareness and foster a common understanding of Re-Co activities. When conducted systematically and comprehensively, Re-Co is a powerful tool for evaluating current or past energy performance and management practices. Additionally, this session provided efficient tips on identifying typical mistakes that influence energy performance, such as incomplete equipment installation or inappropriate settings of control devices.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/marko-peckaj>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/12/62/55>

**Recording:** <https://academy.timepac.eu/en/lecture-materials/12/62/82>

### **Session 2: Distinguishing Re-Co from Energy Audits and Retrofits**

Re-Co activities can be regarded as part of an energy audit, focusing primarily on identifying low-cost energy efficiency measures that can be implemented during the audit's execution. The inspection of the on-site metering system establishes a direct link between Re-Co and energy auditing. On-site metering holds significance as it furnishes first-hand information on energy performance. This session provided practical and effective tips on inspecting existing metering infrastructure, devising a simple and reliable metering plan, and facilitating target setting.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/boris-sucic>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/12/63/56>

**Recording:** <https://academy.timepac.eu/en/lecture-materials/12/63/83>

### **Session 3: Re-Co in the Building Life Cycle**

This session provided a variety of examples of Re-Co measures applicable throughout the building's life cycle. Participants were also received insights into of the Re-Co report. The content of this report must always be tailored to the complexity of the systems inspected and evaluated. The primary objective of the final report is to persuade the building owner to initiate the implementation of proposed performance improvement measures and projects, demonstrating that these measures can compete effectively with other investment opportunities in terms of their own return on investment.

Lecturer: <https://academy.timepac.eu/en/lecturers/gasper-stegnar>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/64/57>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/64/84>

#### **Session 4: Re-Co and EPC**

This session outlined how the EPC generation process can be integrated with Re-Co activities. In this context, these activities are regarded as components of a quality-oriented process aimed at achieving, verifying, and documenting whether a building's systems and equipment performance still aligns with the originally defined objectives and criteria. Participants learned how to utilise the data collection process to identify performance improvement opportunities from the collected and calculated data. Additionally, participants learned how to use the Re-Co checklist to ensure that critical performance opportunities are effectively identified.

Lecturer: <https://academy.timepac.eu/en/lecturers/gasper-stegnar>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/65/59>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/65/85>

#### **Session 5: Planning Re-Co activities**

For any activity related to energy performance assessment, planning and preparation are crucial phases. The planning activities within the framework of the Re-Co should be documented in the form of a work plan, which should be shared with the owner/users before visiting the building to carry out the intended work. The work plan must outline which part of the building is to be visited, the purpose of the visit, the documentation and data required, and the necessary personnel to be involved. This session presented the main elements of proper planning of site visits.

Lecturer: <https://academy.timepac.eu/en/lecturers/marko-peckaj>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/66/58>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/66/86>

#### **Session 6: Re-Co and BACS**

The term 'Building Automation and Control System' (BACS) refers to centralised systems that monitor, control, and record the functions of various building systems. Building facilities monitored and controlled by a reliable BACS tend to maintain the building environment more efficiently, reducing the building's environmental impact and energy costs. This session outlined how to assess existing on-site sensors, metering and control equipment within the framework of Re-Co. Participants learned how to identify performance improvement opportunities based on the settings of the existing control systems.

Lecturer: <https://academy.timepac.eu/en/lecturers/boris-sucic>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/67/60>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/67/87>

#### **Session 7: Re-Co and HVAC**

This session described a systematic, quality-oriented process aimed at enhancing the performance and sustainability of existing HVAC systems. Participants were guided through a step-by-step process to maximise facility effectiveness while minimising investment and ensuring long-term benefits. Common best practices in HVAC optimisation were also presented. In addition, the session

covered the content of the resulting report, including suggestions and proposals, cost estimates, evaluation of the amortisation period, and estimates of savings in terms of both consumption and cost.

Lecturer: <https://academy.timepac.eu/en/lecturers/vincenzo-corrado>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/68/61>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/68/88>

### Session 8: Re-Co and electrical lighting

Lighting systems play a crucial role in creating a comfortable working environment. However, over time, all lighting systems become less efficient. One of the main goals of re-commissioning lighting systems is to improve the building energy efficiency. This can be achieved by identifying and addressing issues such as over-lighting, optimising lighting control, and the use of outdated or inefficient lighting technologies. This session provided an overview of the main steps involved in assessing existing lighting systems, identifying opportunities for improvement, developing a plan of action, implementing changes, monitoring and evaluating performance, conducting regular maintenance, and creating documentation.

Lecturers: <https://academy.timepac.eu/en/lecturers/boris-sucic> and <https://academy.timepac.eu/en/lecturers/matej-pahor>

Presentation: <https://academy.timepac.eu/en/lecture-materials/12/69/62>

Recording: <https://academy.timepac.eu/en/lecture-materials/12/69/89>

## 2.3 Quality assurance and feedback from the audience

Quality assurance for this webinar was implemented through a structured questionnaire that included various aspects of the course (see Annex A “Evaluation form for Webinar 6”). The questionnaire was completed at the end the session by 14 participants.

The audience's feedback was largely positive. When asked whether their expectations regarding the content and structure of webinar were fully met, the majority of respondents responded affirmatively . Out of the responses collected, 12 participants expressed that their expectations were “completely” met, while 2 participants felt that their expectations were “partly” met (Figure 2). This feedback reflects a strong overall satisfaction with the webinar, demonstrating its effectiveness in delivering the intended content and meeting the audience's needs.

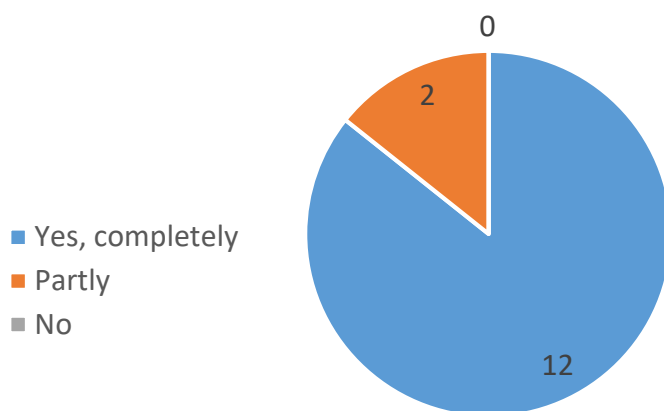


Figure 2. Were your expectations regarding the content and implementation method of the Operational optimisation of building energy performance based on activities during EPC generation webinar met?

When asked if they acquired new information, the majority of participants responded positively (Figure 3). Specifically, 12 attendees indicated that they received new information “completely”, while once again 2 participants felt they did so “partly”. Nobody responded with “No”. This feedback highlights the webinar’s success in providing substantial and relevant information to most of its audience, contributing to their understanding of the role of combining activities and exploring the synergies between energy performance certification, technical system inspections, and energy auditing for achieving a decarbonised building stock by 2050.

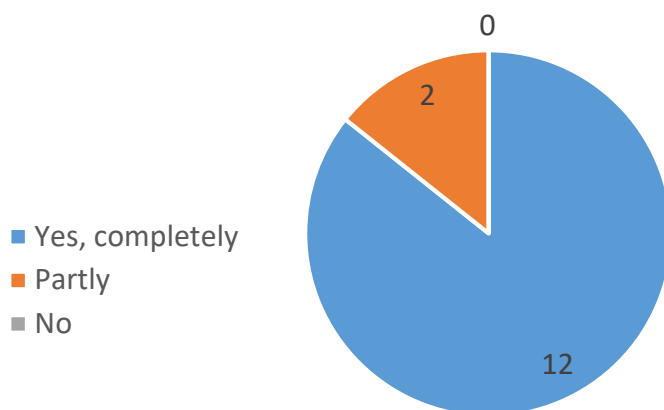


Figure 3. Did you acquire new information on enhancing EPCs to make them useful instruments for the decarbonisation of the building stock?

The audience's responses to whether the concept of Re-Commissioning is useful for future enhancement of EPC were overwhelmingly positive (Figure 4). Out of the feedback collected, once again 12 participants believed that this enhancement would “completely” help in improving the effectiveness of the renovation, while 2 participants felt it would do it “partly”. This positive response underscores the audience's confidence in the potential of combining activities during the EPC generation (EPC, SRI and Re-CO), contributing to more efficient energy use and advancing decarbonisation efforts.

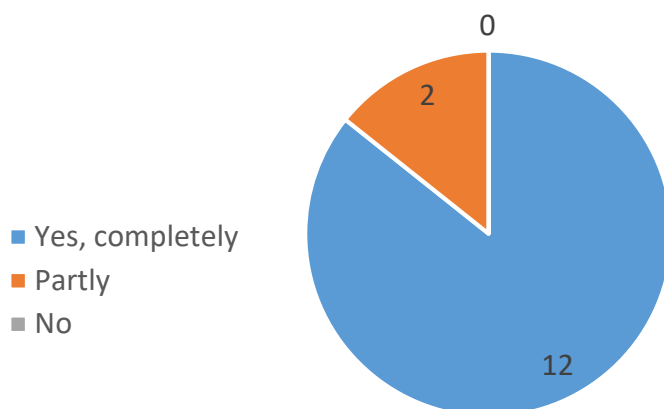


Figure 4. Do you consider Re-Commissioning as a useful concept for future enhancement of energy performance certification of buildings?

The average rating for all sessions was 4.46 out of 5. Specifically, each session was rated as shown in Table 1.

Table 1. Session ratings for the on-line training activity

Session	Rating
Re-Commissioning: Creating Awareness and Common Understanding	4.43
Distinguishing Re-Co from Energy Audits and Retrofits	4.71
Re-Co in the Building Life Cycle	4.14
Re-Co and EPC	4.14
Planning Re-Co activities	4.50
Re-Co and BACS	4.79
Re-Co and HVAC	4.43
Re-Co and electrical lighting	4.57
Average all sessions	4.46

The responses to questions about the TIMEPAC Academy website provided insights into how attendees learned about the webinar, the ease of registration, and their plans for future participation. The majority of responding participants, 10 in total, got to know the webinar through an e-mail from a TIMEPAC partner. Additionally, 2 participants heard through other channels, 1 participant heard about it from a friend, and 1 from the TIMEPAC website.

Regarding the registration process, almost all responding participants found it user-friendly, with 13 indicating that the registration on the website was easy. Only 1 participant encountered some difficulties with the registration process. All participants confirmed that they found the concept of TIMEPAC webinars useful for their professional development.

Obtained feedback stresses the effectiveness of e-mail communication from TIMEPAC partners in attracting attendees, the general ease of the registration process, and a strong interest in ongoing engagement with TIMEPAC Academy.

## 3 In-class training activity in Slovenia

### 3.1 Introduction

The in-class course ["Operational optimisation of building energy performance based on activities during EPC generation"](#) was announced in the TIMEPAC Academy in English and Slovenian (Figure 5). It took place on May 28 and 29, 2024, at the Jožef Stefan Institute Reactor Centre Podgorica (Figures 6 and 7).

The screenshot shows the website interface for the course. The main heading is "Operativna optimizacija energetske učinkovitosti stavbe v okviru priprave energetskih izkaznic". Below this, there is a detailed description of the course's goals and content. A sidebar on the right lists key details: the course is for professionals in energy certification, assessment, architecture, engineering, and energy management; it is scheduled for May 28-29, 2024, from 8:30 to 14:30 CET; it consists of 16 sessions; the organizer is JSI; the location is Ljubljana, Slovenia; and the language is Slovenian/English. A "Prijava" (Registration) button is visible at the bottom of the sidebar.

Figure 5. Announcement of the in-class course on the TIMEPAC Academy website in Slovenian language

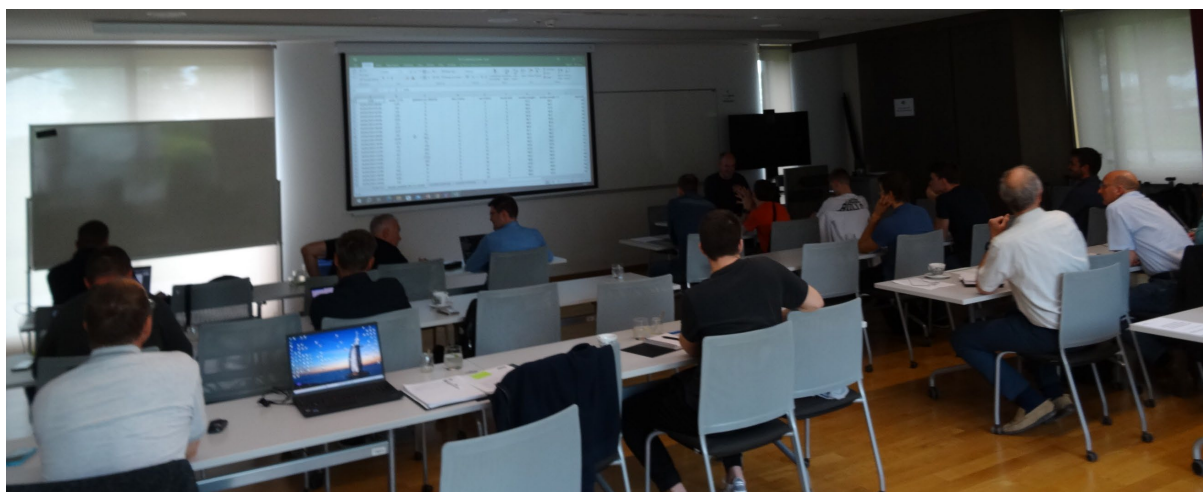


Figure 6. A snapshot of the first-day of in-class training in Ljubljana



Figure 7. A snapshot of the second day of in-class training in Ljubljana

This course was the follow-up of the webinar on the same topic delivered on March 23, 2024 and logical continuation of the in-person course on ["EPC data collection, validation and exploitation"](#), that took place on May 21 and 22, 2024, at the Jožef Stefan Institute. This was also an international event organised in cooperation with Slovenian (JSI, GOLEA, MOPE), Italian (EDIC and POLITO- online lecture), and Cypriot (CUT - in-class lecture) TIMEPAC partners.

The purpose of the in-class training on Operational optimisation of building energy performance based on activities during EPC generation was to expand upon the concepts introduced in the webinar, offering participants practical applications and comprehensive training. Given the critical role EPCs play in the EU's strategy to enhance building energy efficiency, this training focused on improving their implementation by addressing inconsistencies across member states in terms of data collection, information quality, exploitation, user-friendliness, and at the same time providing real savings for building users and owners.

This training focused on the practical synergies between energy performance certification, technical building system inspections, re-commissioning and energy auditing, all aimed at optimising the EPC generation process and explaining how to combine the on-site visit with re-commissioning activities. Participants engaged in hands-on activities centred around effective strategies for data collection and validation to ensure precision and reliability.

One of the key highlights of the training was its focus on the significant benefits of Re-Co for both building users and owners. Re-Co, which involves fine-tuning building systems to ensure they operate at optimal performance levels, addresses issues such as ageing equipment and changing occupant behaviour or space usage. By recalibrating these systems, Re-Co can substantially improve the overall energy performance of a building, leading to tangible energy savings and reduced operational costs. This process not only results in enhanced comfort for building occupants through better indoor environmental quality but also provides real financial benefits for owners by lowering energy bills and improving asset value.

Re-Co was presented as a cost-effective component of the EPC generation process, with long-term energy savings far outweighing any initial expenses. The training demonstrated how even minor adjustments to system parameters, identified through rapid energy audits, can yield significant improvements in energy efficiency. Participants explored the Re-Co process in detail, learning how it integrates seamlessly with EPC generation and energy auditing to deliver optimised building performance. Furthermore, the training covered techniques for monitoring and comparing actual versus expected energy performance, giving participants practical insights into maintaining system efficiency over time. The training once again emphasised the importance of gathering supplementary data on HVAC systems, lighting, appliances, occupancy, and space utilisation, which are crucial for providing an accurate assessment of a building's energy performance. Additionally, insights into SRI auditing and the TIMEPAC Code of Conduct for Smart Readiness and Sustainability Rating equipped participants with actionable skills to drive improvements in building energy efficiency.

Each session was dedicated to providing a deep understanding of the role of EPCs in energy performance assessment and how Re-Co can be leveraged to plan and execute comprehensive energy renovation projects. The training made clear that Re-Co is not just about compliance but about delivering real, measurable benefits for building owners and users through improved energy performance and long-term cost savings. Each of these objectives was covered in dedicated sessions, providing a thorough understanding of the role of EPCs in energy performance assessment and planning implementation of comprehensive energy renovation projects.

Overall, the course was attended by 30 participants with different profiles (architects, engineers, academics, etc.), representatives of the local orders of architects and engineers, of the public administration, and from the private sector (energy consultants, research bodies) (Table 2).

**Table 2.** Organisations participating in the in-class training activity

Organisations	
AMZS	Dom upokojencev Ptuj
Kolektor Koling	EPF NG
Telekom Slovenije	IMP TEN
Ekosystem	Imobilia-GBK
GOLEA	Projektiranje in svetovanje
Petrol	CUT
BTC	Energetika Ljubljana
ENSVET	Energija2
NLB	SIJ Acroni
HTC Green	ABM Facility Management
Kemijski inštitut	URI Soča
MOPE	ENERGAP
JSI	Self-employed project engineer

### 3.2 Structure and content

The in-class activity was structure in the following sessions, spanning over two days:

#### DAY 1

##### **Session 1: Selection of appropriate buildings for Re-Co activities - trend analysis and utility bill analysis**

Re-Co is the process of re-optimising existing buildings that have already been commissioned. It aims to ensure that building equipment and systems are operating at their best to meet the current needs of occupants. This exercise provided guidelines and examples of how to select appropriate buildings for the Re-Co activities. Participants also learned how to justify why certain buildings are suitable candidates for the Re-Co activities and how to rank them. This exercise also provided



efficient tips on how to identify typical mistakes that influence energy performance (incomplete installation of equipment, inappropriate settings of the control devices, etc.).

Lecturer: <https://academy.timepac.eu/en/lecturers/marko-peckaj>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/115/135>

### **Session 2: Creation of realistic Re-CO implementation plan - case study educational building**

Planning and preparation are crucial phases for any activity related to the energy performance assessment. The planning activities in the framework of the Re-Co should be documented in the form of a work plan, which should also be shared with the owner/users prior to visiting the building to carry out the intended work. The work plan must outline which part of the building is to be visited, the purpose of the visit, the documentation and data required, and the necessary personnel to be involved. This exercise provided guidelines and examples of how to create a realistic Re-CO implementation plan with a focus on educational buildings. Additionally, participants learned how to incorporate measurement and verification activities within the Re-Co implementation plan.

Lecturers: <https://academy.timepac.eu/en/lecturers/marko-peckaj>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/116/136>

### **Session 3: Data collection and inspection of energy management systems**

This exercise provided a set of examples of Re-Co measures that can be extracted from the energy management data. Participants were also informed about the content of the Re-Co report. The exact content of the report should always be adjusted based on the complexity of the inspected and evaluated systems. Also, this exercise provided practical and effective tips on how to inspect existing metering infrastructure, create simple and reliable metering plans and enable target setting. On-site metering is important because it provides first-hand information on energy performance.

Lecturer: <https://academy.timepac.eu/en/lecturers/boris-sucic> and  
<https://academy.timepac.eu/en/lecturers/matej-pahor>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/117/140>

Materials: <https://academy.timepac.eu/en/lecture-materials/17/117/141>

### **Session 4: HVAC Re-commissioning - improving indoor environmental quality**

This exercise described a systematic quality-oriented process that improves the performance and sustainability of existing HVAC systems. The step-by-step process for getting the best effectiveness from facilities for the lowest investment and ensuring durable benefits was described. Common best practices were also presented. The analysis started from a measured set of data related to a technical building sub-system and compared it with both the technical sheet properties and the building needs. An additional element of the exercise focused on the assessment of the indoor environmental quality, analysing the different aspects such as thermal, acoustic, and lighting comfort.

Lecturer: <https://academy.timepac.eu/en/lecturers/franz-bianco-mauthe-degerfeld>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/118/132>

### **Session 5: Electrical system re-commissioning - improving equipment performance**

This exercise provided examples of how to conduct Re-Co activities connected with the electric power system in order to improve the performance of the equipment and system as a whole. Performance assessment of a building's electric power systems should not focus only on the efficiency of individual devices because, in such a case, most of the opportunities for performance improvement will remain undetected. This exercise also tackled the following performance improvement opportunities: tariff system analysis, load management and demand control, power factor correction, and power quality indicators.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/boris-sucic>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/17/119/138>

**Materials:** <https://academy.timepac.eu/en/lecture-materials/17/119/142>

## **DAY 2**

### **Session 6: Analysis of the context of energy and water consumption - proper benchmarking**

In order to design and propose the proper retrofitting strategies (for both refurbishments and optimisation of the building systems), a robust baseline of the building should be defined and presented to buildings' owners and managers. This exercise is aimed at defining a baseline definition for energy and water consumption in a real building, using a case study approach. It followed a chronological sequence of steps according to EN 16247-1 and EN 16247-2, from the data collection phase to the report elaboration, and included a comparison against relevant benchmarks. This exercise also focused on the quality check of input data, validating calculation assumptions for simulating the building performance, and communication of the analysis output.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/alice-gorrino>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/17/120/133>

### **Session 7: Calculation and verification of energy savings based on Re-Co activities - case study nursery home**

Re-Co activities can be considered as part of energy audit where the main emphasis is on identification of low-cost energy efficiency measures which can be implemented during the implementation of energy audit. This exercise provided an example of how to calculate and verify energy savings triggered by Re-Co activities. Participants learned how to specify continuous re-commissioning using energy management system functionalities and how to create the measurement and verification plan based on Re-Co activities in a nursery home.

**Lecturers:** <https://academy.timepac.eu/en/lecturers/marko-peckaj>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/17/121/137>

### **Session 8: Calculation of SRI based on Re-Co activities and extracting energy efficiency and flexibility measures**

This exercise focused on the dynamics of the data collection for the calculation of the SRI and provided examples of how it could be connected with the re-commissioning activities. In this context, re-commissioning activities are seen as elements of a quality-oriented process for achieving, verifying, and documenting whether the performance of a building's systems and equipment still meet originally defined objectives and criteria. Participants learned how they can utilise the data collection process for calculation of SRI to understanding cause-effect relationships between various systems and how to properly interpret collected, calculated and measured data and evaluate performance.

Lecturer: <https://academy.timepac.eu/en/lecturers/boris-sucic>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/122/139>

Materials: <https://academy.timepac.eu/en/lecture-materials/17/122/144> and <https://academy.timepac.eu/en/lecture-materials/17/122/143>

### Session 9: Creation of short and long-term plans for implementing improvements

This exercise provided hands-on experience in creating short and long-term plans for implementing improvements in building energy efficiency using enhanced EPC. It also empowered participants to understand the key components and considerations involved in creating short and long-term plans for implementing improvements in building energy efficiency, and how to use the enhanced EPC to identify and prioritise energy efficiency improvements in a building. Participants were provided with a case study of a specific building prior to the exercise. Two case studies were pre-selected and involved public school and private residential buildings.

Lecturer: <https://academy.timepac.eu/en/lecturers/alexandros-charalambides>

Presentation: <https://academy.timepac.eu/en/lecture-materials/17/123/134>

## 3.3 Quality assurance and feedback from the audience

The quality assurance for this course was implemented through a structured questionnaire that encompassed various aspects of the course (see annex B “Evaluation form for in-class training activity”). The questionnaire was completed at the end the last session by 21 persons.

The feedback collected from the participants provides insights into their perceptions and experiences with the course. The responses indicate a generally positive reception, with the majority of participants reporting that their expectations were fully met (Figure 8).

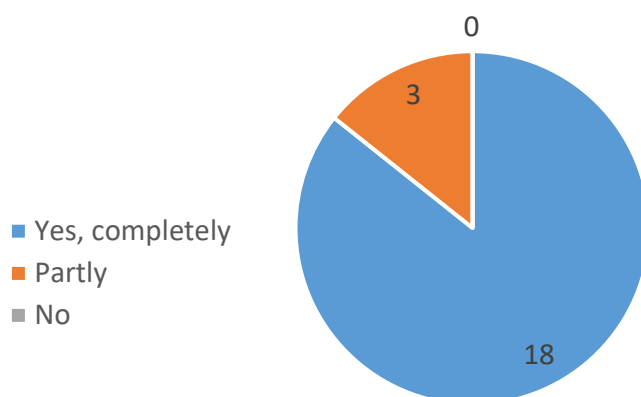


Figure 8. Have your expectations been met regarding the content and format of the course?

The average rating for all sessions was 4.76 out of 5. Specifically, each session was rated considering different aspects (i.e., speaker’s competence, methods used, usefulness for practice, and presentation contents), as shown in Table 3.

Table 3. Session ratings for the in-class training activity

	Speaker's competence	Methods used	Usefulness for practice	Presentation contents	Average	
Session	Selection of appropriate buildings for Re-Co activities - trend analysis and utility bill analysis	4.71	4.57	4.67	4.62	4.64
	Creation of realistic Re-CO implementation plan - case study educational building	4.76	4.71	4.71	4.67	4.71
	Data collection and inspection of energy management systems	4.86	4.76	4.86	4.71	4.80
	HVAC Re-commissioning - improving indoor environmental quality	4.73	4.64	4.55	4.68	4.65
	Electrical system re-commissioning - improving equipment performance	4.91	4.86	4.86	4.86	4.88
	Analysis of the context of energy and water consumption - proper benchmarking	4.71	4.71	4.71	4.57	4.68
	Calculation and verification of energy savings based on Re-Co activities - case study nursery home	4.81	4.71	4.76	4.71	4.75
	Calculation of SRI based on Re-Co activities and extracting energy efficiency and flexibility measures	4.95	4.76	4.90	4.90	4.88
	Creation of short and long-term plans for implementing improvements	4.80	4.85	4.80	4.85	4.83
	Average all sessions					4.76

The comments received on the questionnaires revealed that the participants appreciated the training and found the interaction between the speakers and the audience interesting and stimulating. Many attendants found very useful the comparison between different stakeholders (professionals, academics, local professional orders...), hoping in their collaboration in the future for an effective decarbonisation of the building stock. In addition, the networking during the lunch break allowed to share experiences and ideas.

Among the different sessions, participants shared their preferences for those they found most valuable. The excellent performance of both the online presenters from Italy and the in-class presenter from Cyprus was recognised and highly appreciated. Some participants expressed particular interest in the practical implementation of Re-Co within the context of future updates to Slovenia's energy policy framework. Others were more focused on understanding effective methods for data extraction from energy management and other monitoring systems. One participant emphasised that the training empowered him to better understand peak periods of energy consumption, enabling him to propose effective energy-flexibility measures. This practical insight highlights the course's value in equipping professionals with the knowledge to implement real-world solutions for optimising building energy performance.

Many participants hope for a replication of similar course in the future. The overall feedback collected reveals that the course was well-received and effectively met the learning needs of the participants.

## 4 In-class training activity in Cyprus

### 4.1 Introduction

The in-person course ["Operational optimisation of building energy performance based on activities during EPC generation"](#) was announced at the TIMEPAC Academy website in English and Greek (Figure 9). It took place on September 23, 2024, at the premises of Cyprus Energy Agency in Nicosia (Figure 10). This course was the follow-up of the webinar on the same topic delivered on March 23, 2024. This was also an international event organised in cooperation with Cypriot (CEA and CUT) and Slovenian (JSI) TIMEPAC partners.

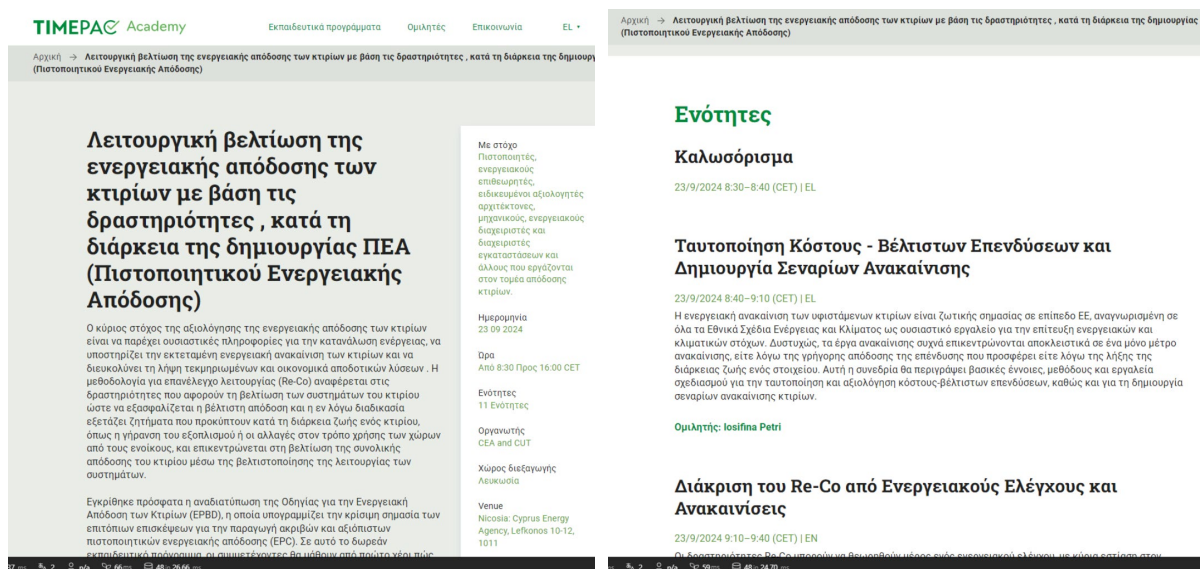


Figure 9. Announcement of the in-class course on the TIMEPAC Academy website in Greek language



Figure 10. A snapshot of in-class training in Nicosia

Overall, the course was attended by 13 participants with different profiles (architects, engineers, academics, etc.), representatives of the local orders of architects and engineers, of the public administration, and from the private sector (energy consultants, research bodies) (Table 4).

Table 4. Organisations participating in the in-class training activity (Cyprus)

Organisations	
CEA	CUT
JSI	WDD
The Cyprus Institute	Independent Engineer

## 4.2 Structure and content

The in-class activity was structure in the following sessions, spanning over one day:

### DAY 1

#### Session 1: Identification of Cost-Optimal Investments and Creation of Renovation Scenarios

The energy renovation of existing buildings is crucial at the EU level, acknowledged in all National Energy and Climate Plans as a vital tool for achieving energy and climate objectives. Unfortunately, renovation projects often focus solely on a single retrofit measure, either due to the quick investment return it offers or the expiration of an element’s lifetime. This session described key concepts, methods, and planning tools for identifying and assessing cost-optimal investments, as well as for creating building renovation scenarios.

Lecturer: <https://academy.timepac.eu/en/lecturers/iosifina-petri>

Presentation: <https://academy.timepac.eu/en/lecture-materials/20/144/159>

#### Session 2: Distinguishing Re-Co from Energy Audits and Retrofits

Re-Co activities can be regarded as part of an energy audit, focusing primarily on identifying low-cost energy efficiency measures which can be implemented during the audit’s execution. The inspection of the on-site metering system establishes a direct link between Re-Co and energy auditing. On-site metering holds significance as it furnishes first-hand information on energy performance. This session provided practical and effective tips on inspecting existing metering infrastructure, devising a simple and reliable metering plan, and facilitating target setting.

Lecturers: <https://academy.timepac.eu/en/lecturers/boris-sucic>

Presentation: <https://academy.timepac.eu/en/lecture-materials/20/145/160>

#### Session 3: Calculation of SRI based on Re-Co activities and extracting energy efficiency and flexibility measures

This exercise focused on the dynamics of the data collection for the calculation of the SRI and it provided examples how it could be connected with the re-commissioning activities. In this context, re-commissioning activities are seen as elements of a quality-oriented process for achieving, verifying, and documenting whether the performance of a building’s systems and equipment still meet originally defined objectives and criteria. Participants learned how they can utilise the data collection process for calculation of SRI to understanding cause-effect relationships between various systems and how to properly interpret collected, calculated and measured data and evaluate performance.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/boris-sucic>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/20/146/161>

**Materials:** <https://academy.timepac.eu/en/lecture-materials/20/146/162>,  
<https://academy.timepac.eu/en/lecture-materials/20/146/163>

#### **Session 4: Data collection and inspection of energy management systems**

This exercise provided a set of examples of Re-Co measures that can be extracted from the energy management data. Participants were also informed about the content of the Re-Co report. The exact content of the report should always be adjusted based on the complexity of the inspected and evaluated systems. Also, this exercise provided practical and effective tips on how to inspect existing metering infrastructure, create simple and reliable metering plans and enable target setting. On-site metering is important because it provides first-hand information on energy performance.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/boris-sucic>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/20/148/164>

**Materials:** <https://academy.timepac.eu/en/lecture-materials/20/148/165>

#### **Session 5: Creation of short and long-term plans for implementing improvements**

This exercise provided hands-on experience in creating short and long-term plans for implementing improvements in building energy efficiency using enhanced EPC. It also empowered participants to understand the key components and considerations involved in creating short and long-term plans for implementing improvements in building energy efficiency, and how to use the enhanced EPC to identify and prioritise energy efficiency improvements in a building. Participants were provided with a case study of a specific building prior to the exercise. Two case studies were pre-selected and involved public school and private residential buildings.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/alexandros-charalambides> and  
<https://academy.timepac.eu/en/lecturers/sara-mariza-vryonidi>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/20/149/166>

**Materials:** <https://academy.timepac.eu/en/lecture-materials/20/149/167>

#### **Session 6: Electrical system re-commissioning - improving equipment performance**

This exercise provided examples of how to conduct Re-Co activities connected with the electric power system in order to improve the performance of the equipment and system as a whole. Performance assessment of a building's electric power systems should not focus only on the efficiency of individual devices because, in such a case, most of the opportunities for performance improvement will remain undetected. This exercise also tackled the following performance improvement opportunities: tariff system analysis, load management and demand control, power factor correction, and power quality indicators.

**Lecturer:** <https://academy.timepac.eu/en/lecturers/boris-sucic>

**Presentation:** <https://academy.timepac.eu/en/lecture-materials/20/151/168>

**Materials:** <https://academy.timepac.eu/en/lecture-materials/20/151/169>



### 4.3 Quality assurance and feedback from the audience

Quality assurance for this course was not implemented. However, in cooperation with the Technical Chamber of Cyprus (E TEK), a motivational workshop was organised in Limassol on September 25, 2024, at the premises of Cyprus University of Technology (Figure 11). This workshop was the follow-up of the in-class training and it focused on explaining why EPC/SRI/energy efficiency is important and why students should consider a career in this field. Participants were final year chemical engineering students at the Cyprus University of Technology. Overall, the workshop was attended by 12 participants.



Figure 11. A snapshot of motivational workshop in Limassol

## 5 Conclusion

The training activities, including the webinar and two in-class courses in Ljubljana and Nicosia were aimed at providing professionals and stakeholders in building energy performance assessment, energy efficiency, facility management, consulting, and policy-making, with valuable insights aligned with the goals of the recently adopted EPBD.

Feedback received from participants of both the webinar and the course on the topic "Operational optimisation of building energy performance based on activities during EPC generation" organised in Slovenia revealed high satisfaction levels, with a majority indicating that their expectations were met and that they acquired new and relevant information. The webinar ratings averaged 4.46 out of 5, reflecting the effectiveness of the training. This positive response underscores the audience's confidence in the potential of the enhanced EPC to boost the renovation of the building stocks, contributing to more efficient energy use and advancing decarbonisation efforts. Similarly, the in-class training in Ljubljana obtained positive feedback; the course ratings averaged 4.76 out of 5. Participants from diverse professional backgrounds expressed strong interest in the exploitation of the EPC data to carry out energy analysis of the building technical systems and identify realistic energy efficiency and flexibility measures.

According to the latest EPBD, Member States must develop a national building renovation plan. Its implementation will depend directly on the involvement of public bodies at different levels. Therefore, the participation of different profiles (architects, engineers, academics, etc.), representatives of the public administration (state and municipality level), and from the private sector (energy consultants, research bodies) helped to enrich, strengthen relationships and foster new contacts. Many attendants found the comparison between different stakeholders (consultants, academics, technology providers, facility managers, and certifiers) very useful, and hope for their collaboration in the future for an effective decarbonisation of the building stock.

Most participants expressed considerable interest in future webinars and in applying the training insights to their professional activities. Some were particularly interested in the practical implementation of Re-commissioning (Re-Co) within the context of future updates to Slovenia's energy policy framework. Others focused on understanding effective methods for data extraction from energy management and monitoring systems to better analyse energy consumption patterns and propose effective energy efficiency and flexibility measures. These practical insights underscore the course's value in equipping professionals with the knowledge to implement real-world solutions for optimising building energy performance.

The positive feedback and high engagement levels underscore the importance and effectiveness of these training efforts. Overall, the training activities were well-received, meeting the learning needs of the participants and contributing to the advancement of EPBD objectives through accurate and easy-to-use methods for operational optimisation of building energy performance based on activities during EPC generation.

# Annex A – Evaluation form online training activity

## EPC data collection, validation and exploitation

Thursday, March 23, 2024

- Were your expectations regarding the content and implementation method of the Operational optimisation of building energy performance based on activities during EPC generation met?

- Yes, completely
- Partly
- No

- Did you acquire new information on enhancing EPCs to make them useful instruments for the decarbonisation of the building stock?

- Yes, completely
- Partly
- No

- Do you consider Re-Commissioning as a useful concept for future enhancement of energy performance certification of buildings?

- Yes, completely
- Partly
- No

- We kindly ask you to evaluate all sessions presented at the EPC data collection, validation and exploitation webinar [1 to 5].

- Re-Commissioning: Creating Awareness and Common Understanding (Marko Pečkaj)
- Distinguishing Re-Co from Energy Audits and Retrofits (Boris Sučić)
- Re-Co in the Building Life Cycle (Gašper Stegnar)
- Re-Co and EPC (Gašper Stegnar)
- Planning Re-Co activities (Marko Pečkaj)
- Re-Co and BACS (Boris Sučić)
- Re-Co and HVAC (Vincenzo Corrado)
- Re-Co and electrical lighting (Boris Sučić and Matej Pahor)

- Which session was the most relevant for your professional practice?

- Re-Commissioning: Creating Awareness and Common Understanding (Marko Pečkaj)
- Distinguishing Re-Co from Energy Audits and Retrofits (Boris Sučić)
- Re-Co in the Building Life Cycle (Gašper Stegnar)
- Re-Co and EPC (Gašper Stegnar)
- Planning Re-Co activities (Marko Pečkaj)
- Re-Co and BACS (Boris Sučić)
- Re-Co and HVAC (Vincenzo Corrado)
- Re-Co and electrical lighting (Boris Sučić and Matej Pahor)

- Within the EPC data flow—generation, storage, analysis, and exploitation— which stage of this continuous cycle do you consider the most critical for improving building assessment?

- Generation
- Storage
- Analysis
- Exploitation

- Where did you know about TIMEPAC Academy?

- e-mail from a TIMEPAC partner
- e-mail from a friend
- TIMEPAC website
- social media
- other

- Was the registration on the website easy?

- Yes
- No

- Do you find concept of TIMEPAC webinars useful for your professional development?

- Yes
- No

- Are you planning to participate in other TIMEPAC webinars?

- Yes
- No

- Final comments and remarks

## Annex B – Evaluation form in-class training in Slovenia

### Operational optimisation of building energy performance based on activities during EPC generation






May 28 and Wednesday, May 29, 2024

- Were your expectations regarding the contents and the organisation of the *in-class training TIMEPAC* met?

- Yes, completely
- Partly
- No

- We kindly ask you to evaluate all the sessions presented in the *in-class training TIMEPAC*

To answer to this point, the following grid has been adopted, considering the evaluation scale from 1 (double sad icon) to 5 (double happy icon):

					
• Speaker's competence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Methods used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Usefulness for practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Presentation contents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Presentation length	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
	Too short		Adequate		Too long

Notes (e.g., what is missing in the presentation, what is superfluous, etc.): .....






The evaluation grid has been adopted for each session, as follows:

- Selection of appropriate buildings for Re-Co activities - trend analysis and utility bill analysis (Marko Pečkaj)
- Creation of realistic Re-CO implementation plan - case study educational building (Marko Pečkaj)
- Data collection and inspection of energy management systems (Boris Sučić and Matej Pahor)
- HVAC Re-commissioning - improving indoor environmental quality (Franz Bianco Mauthe Degerfeld)
- Electrical system re-commissioning - improving equipment performance (Boris Sučić)

- Analysis of the context of energy and water consumption - proper benchmarking (Alice Gorrino)
- Calculation and verification of energy savings based on Re-Co activities - case study nursery home (Marko Pečkaj)
- Calculation of SRI based on Re-Co activities and extracting energy efficiency and flexibility measures (Boris Sučić)
- Creation of short and long-term plans for implementing improvements TIMEPAC vision and motivation (Alexandros Charalambides)

- We kindly ask you to evaluate all the other aspects of the *in-class training TIMEPAC*

Aspects related to the organisation

					
• Invitation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Organisation and registration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Room and equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Coffee break	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
• Networking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Notes: .....

- I have liked more ...

- Final remarks