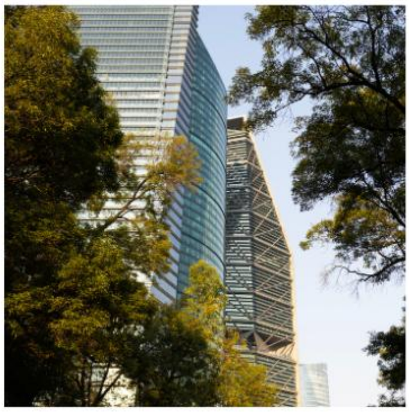
PROSPECT



Learning Handbook on Energy Performance Contracting (EPC)

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About the project

PROSPECT aims to strengthen the capacity of local and regional authorities (LRAs) across Europe to implement sustainable energy and climate actions by reducing reliance on public funding and increasing the use of innovative financing schemes (e.g., one-stop-shops, energy agencies, energy communities). The project offers a peer-to-peer Capacity Building Programme (CBP) tailored to the needs and time constraints of LRAs, available in multiple languages and structured in adaptable learning modules. Through large-scale outreach, including very small and remote LRAs, PROSPECT CUBE acts as an entry point to EU programmes and financing opportunities for authorities with limited experience in the field.

PROSPECT CUBE builds upon two successful Horizon 2020 initiatives: PROSPECT (2017–2020) and PROSPECT+ (2022–2025).

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List of abbreviations

Abbreviation	Description
BPQR	Best Price–Quality Ratio
BPIE	Buildings Performance Institute Europe
CAPEX	Capital Expenditures
CO_2	Carbon Dioxide
EC	European Commission
EE	Energy Efficiency
EED	Energy Efficiency Directive
EIB	European Investment Bank
ELENA	European Local Energy Assistance
EnPI	Energy Performance Indicator
EPBD	Energy Performance of Buildings Directive
EPC	Energy Performance Contracting
ESA	European System of Accounts
ESCO	Energy Service Company
EU	European Union
EV	Electric Vehicle
GPP	Green Public Procurement
HVAC	Heating, Ventilation and Air-Conditioning
IEA	International Energy Agency
IPMVP	International Performance Measurement and Verification Protocol
ISO	International Organization for Standardisation
IoT	Internet of Things
KWh	Kilowatt-hour
LRAs	Local and Regional Authorities
MEAT	Most Economically Advantageous Tender
MUSH	Municipal buildings, Universities, Schools, Hospitals
M&V	Measurement and Verification
NBRP	National Building Renovation Plan
OPEX	Operational Expenditures
PPP	Public–Private Partnership
RES	Renewable Energy Sources
ROI	Return of Investment
SECAP	Sustainable Energy and Climate Action Plan
TCO	Total Cost of Ownership
VOI	Value of Investment

1. Introduction

As cities and companies across the public and private sectors face growing pressure to decarbonise, reduce emissions, improve energy efficiency (EE), and meet increasingly ambitious climate and sustainability targets, they are often required to balance these goals with budgetary constraints and operational complexity. Ageing infrastructure, rising energy costs, and the need to maintain service continuity make large-scale energy upgrades particularly challenging for municipalities, public services, and private operators alike.

Energy Performance Contracting (EPC) is emerging as a practical and results-oriented financing solution that is rapidly gaining traction across sectors. EPC is a performance-based financing and delivery framework that enables organisations to deploy energy efficiency, renewable energy (RES), and infrastructure modernisation measures, while linking payments directly to verified performance results.

Typically, under an EPC a specialised Energy Service Company (ESCO) designs, implements, and often finances or cofinance the project, with repayment occurring over time through guaranteed energy or cost savings. This approach allows public and private entities across multiple sectors to reduce energy consumption, modernise assets, and achieve decarbonisation goals without assuming the full technical, operational, or financial risk of the investment.

1.1. Purpose of this handbook

The purpose of this handbook is to enhance readers' understanding of the core principles of EPC, the steps required to design and procure an EPC project, and the institutional, technical, and financial considerations that commonly arise during implementation. It builds on examples of good practice, lessons learned, and practical guidance developed through previous PROSPECT initiatives and is updated and expanded to incorporate fresh case studies and new implementation insights.

Overall, the handbook is designed to serve as an initial practical reference for public organisations, providing a solid foundation for the development of high-quality EPC projects that are compliant, bankable, and aligned with national and EU energy objectives.

1.2. Target audience

The handbook is relevant for a broad range of actors - both newcomers to EPC and experienced practitioners - involved in the planning, management, renovation, and operation of public and/or mixed-owned assets, infrastructure, and energy-related services across multiple sectors.

This include but not limited to:

- Municipal and regional authorities responsible for energy planning, asset management, and public service delivery.
- Building, facility, lighting, and urban infrastructure operators, including public buildings, street lighting, and smart-city systems.
- Transport, mobility, utility, and waste management operators overseeing energy-intensive infrastructure and services.
- Social housing providers, housing authorities, and housing associations managing residential portfolios and renovation programmes.
- Energy and climate agencies, EPC facilitators, and technical assistance providers supporting project development and implementation.
- Public-owned companies, inter-municipal entities, public–private partnerships, and energy communities managing shared assets, infrastructure, and local energy initiatives.

1.3. How to use this handbook

This handbook is designed as a modular learning and reference tool, enabling readers to engage with its content according to their role, level of experience, and implementation needs. It follows a structured progression from the core concepts and operational logic of EPC to its practical application, implementation steps, stakeholder roles, financing arrangements, sectoral applications, and critical success factors. In addition, practical examples and case studies illustrate how EPC schemes are structured and implemented in real contexts, supporting LRAs and other stakeholders in assessing their readiness and advancing EPC project development.

While the handbook can be read sequentially to gain a comprehensive overview of EPC, each section is also designed to function independently, allowing readers to focus on the topics most relevant to their context or revisit specific elements when needed.

2. Understanding the EPC

EPC is internationally recognised as a guaranteed, cost-effective, and scalable procurement method for reducing operating costs and environmental impacts across a wide range of energy-intensive assets and services, including buildings, infrastructure, and energy systems. In practice, it is used primarily by public authorities as a low-risk financial and operational mechanism to implement energy upgrades with minimal or no upfront capital investment (European Commission, 2023).

Especially for public authorities, the EU views EPC as a way to unlock EE investments by linking payment to verified savings, making it a key tool under the revised Energy Efficiency Directive (EED) for public sector buildings and beyond.

2.1. How it works in practice?

At its core, EPC involves a contractual arrangement between an "EPC client" (usually a public body or an asset owner) and an "EPC provider" with technical know-how (usually an ESCO), where the second invests in EE and/or RES measures and guarantees energy savings over the duration of the contract[1].

Essentially under the EPC agreement, the ESCO takes complete "turn-key" responsibility for the project, meaning that it provides an integrated package of services covering the full project lifecycle: from the design phase and initial energy audits, including engineering and business case analysis, through to mobilisation of financial resources, installation, commissioning, and long-term Measurement and Verification (M&V) of performance. Most importantly, the ESCO assumes the performance risk for the project in the form of a long-term financial guarantee to ensure that the projected cost savings materialise and are preserved over time[2].

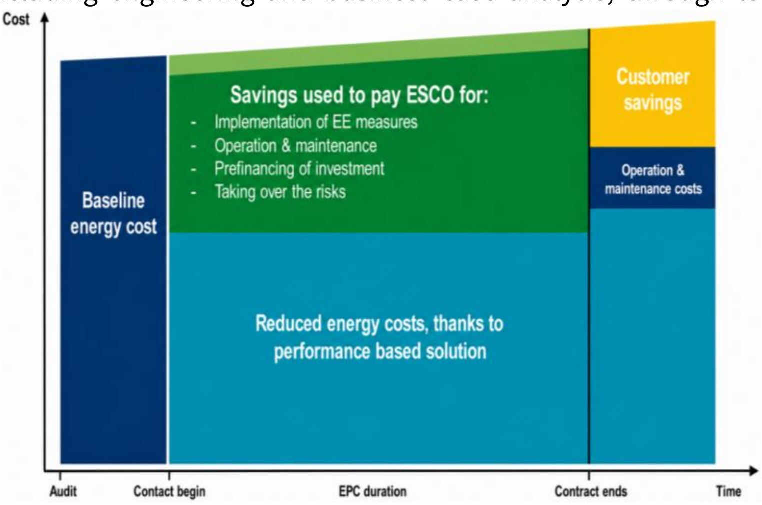

Figure 1. How EPC works in practice

[1] The specific definition of the EPC is found in Article 2, Point (32) of the 2023 recast of the EED (European Union, 2023)
[2] Regular M&V of the project performance ensure that agreed energy savings are realised. Where verified savings fall below the guaranteed level, the ESCO is contractually required to compensate the EPC client, either through direct payment or by adjusting its service or shared-savings remuneration accordingly (Eurostat & European Investment Bank, 2018).

2.2. Arrangements, Types and Characteristics

EPC can be implemented through a variety of contractual arrangements and business models, reflecting substantial differences in how responsibilities and savings are shared between the ESCO and the EPC client. Still, all variants are subject to operate within a common framework defined by the EU legislation and the European Commission (EC) initiatives.

This section provides an overview of the main EPC arrangements and types used in practice and highlights the core characteristics that remain consistent across the different EPC models.

2.2.1. Arrangements

The ESCO's assumption of performance risk, together with the provision of guaranteed savings, enables a range of options for financing the upfront investment required to implement an EPC project. Depending on the selected EPC financing model, the investment may be funded through one or a combination of the following arrangements:

- Owner financing, where the EPC client provides the investment directly.
- ESCO financing, where the EPC provider finances the investment and is repaid through routine performance-based payments.
- Third-party financing, where a financial institution (e.g. a bank) provides debt financing linked to the EPC contract.
- Dedicated third-party entities or investment funds, established to finance EPC or EE projects.
- Public or utility support mechanisms, including grants, subsidised loans, guarantees, or fiscal incentives provided by governments or utilities.

In all cases other than owner financing, EPC financing structure is based on a cash-flow logic whereby upfront investment is recovered over the contract period through performance-based payments linked to verified energy or cost savings.

Based on the funding scheme applied, EPC projects may vary widely in practice; yet, a typical EPC arrangement in a simplified form is schematically represented in Figure 2.

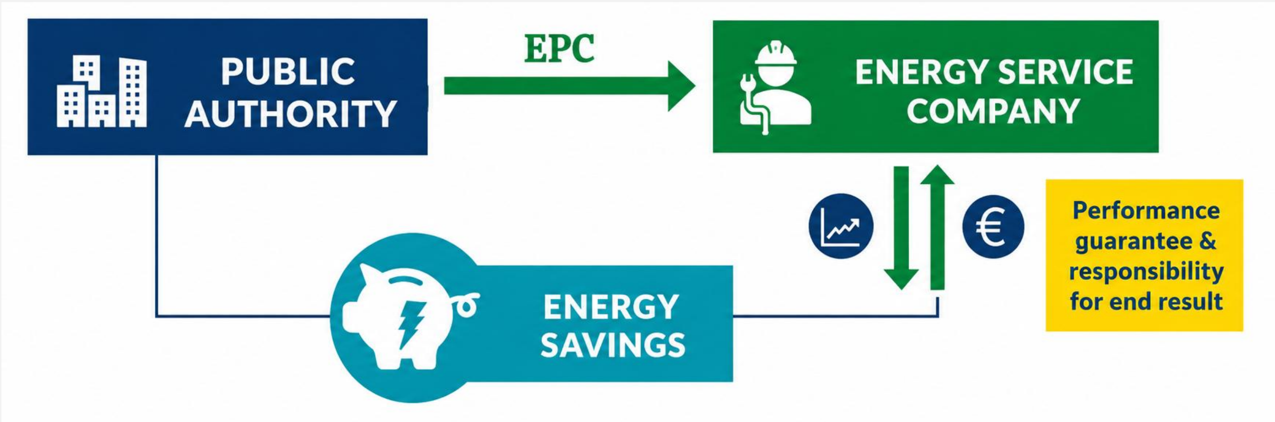

Figure 2. Simplified illustration of a typical EPC arrangement (Source: Eurostat & EIB, 2018)

The following example further explains how this arrangement functions in practice, illustrating the "spend-to-save" payback logic underlying many EPC projects.

Focus Box 1: Consider the scenario

An EPC client enters into a multi-year agreement with an ESCO to implement EE measures under a performance guarantee. To cover the upfront cost of the EPC services, a lending institute provides a loan to the EPC client, which is used to pay the ESCO for the design and the successful project delivery.

Over the contract period, loans are repaid -together with interest - using the verified energy cost savings generated by the project.

Once the contract ends and the investment (loan) is fully recovered, the EPC client retains all subsequent savings and continues to benefit from the permanently lower energy consumption and operating costs, without any further repayment obligations.

2.2.2. Types of EPC (EU context)

From a contractual perspective, several variants of EPCs have been developed over the years in order to accommodate different financing capacities, institutional arrangements, and levels of risk acceptance among EPC clients. Among them, the two most prominent models in the EU are the Guaranteed Savings and Shared Savings models.

Both are performance-based and rely on contractual guarantees linked to the achievement of measurable energy savings, with the common objective of improving EE outcomes while reducing the financial and operational burden for the client (SECCA, 2025). Their main differences relate to financing responsibilities, risk allocation and repayment structures, and influence not only the contractual relationship between the ESCO and the EPC client, but also the suitability of each model for different types of public sector projects and investment contexts, as summarised in Table 1 below.

Table 1. Comparison of the two primary EPC models (EU context)

Aspect	Guaranteed Savings model	Shared Savings model
Basic concept	The ESCO guarantees a defined level of energy or cost savings, while the client typically finances the investment.	The ESCO finances the investment and shares the achieved savings with the EPC client over the contract period.
Upfront investment	Usually provided by the EPC client, often with third-party financing.	Usually provided by the ESCO or through third-party financing arranged by the ESCO.
Savings guarantee	The ESCO guarantees a minimum level of savings and covers any shortfall.	The ESCO's remuneration depends directly on the level of achieved savings.
Risk allocation	Performance risk is transferred to the ESCO, while the credit risk largely remains with the EPC client.	Performance and credit risks are largely carried by the ESCO.
Payment mechanism	The EPC client pays the ESCO a service fee (often a fixed schedule), while retaining 100% of the achieved savings.	Achieved savings are shared between the ESCO and the EPC client according to a pre-agreed percentage.
Incentives structure	Incentives focus on ensuring guaranteed performance and compliance with agreed savings levels.	Strong incentive for the ESCO to maximise savings, as higher savings increase remuneration.
Complexity	Generally simpler to structure.	More complex, requiring careful contractual and financial design.
Typical use cases	More common in the EU public sector, typically for governmental authorities and bodies with access to capital or borrowing capacity.	Used by EPC clients with limited borrowing capacity or a strong preference to avoid upfront investment.

Beyond the two primary EPC model structures other variations recognised in the EU include:

- The Chauffage (or Chaffee) model, also known as Energy Cost Trust, which is a form of energy management outsourcing arrangement (energy supply and service contracting) in which the ESCO assumes the responsibility for delivering a defined energy service (e.g. space heating) under long-term contract (up to 25 years). In this model the EPC client pays a fixed service fee, usually below previous energy expenditure, while the ESCO recovers its investment through efficiency gains, and compensates the client If agreed cost thresholds are exceeded. At the end of the contract period, all savings accrue to the client (De Tommasi L. et al., 2024; EURAC Research, 2018; SECCA, 2025).
- The First-Out (or First Repayment) model is an EPC variant in which 100% of the achieved energy or cost savings are allocated to repaying the ESCO's investment as quickly as possible. The repayment period directly depends on the level of savings achieved, yet the contract duration is flexible and ends once the ESCO has been fully repaid (BOOSTEE-CE, 2019; Eurac Research, 2018).

Focus Box 2: Selecting the appropriate EPC model

There is no universally "best" EPC model. The selection of the most appropriate structure depends on several factors, including the financing capacity of the EPC client, the desired level of risk transfer, project complexity, and institutional or procurement constraints. In practice:

- Guaranteed Savings models are generally more suitable for public authorities with access to capital or borrowing capacity that wish to retain ownership of the investment while transferring performance risk to the ESCO.
- Shared Savings models are often preferred when upfront public investment capacity is limited, as the ESCO assumes a larger share of the financing and financial risk.
- Chauffage models are particularly relevant for long-term energy service delivery arrangements, especially for heating systems and operational energy management.
- First-Out models can accelerate ESCO repayment and are often applied where rapid cost recovery is prioritised.

The final choice should therefore reflect not only financial considerations, but also the technical characteristics of the project, the maturity of the local ESCO market, and the long-term strategic objectives of the EPC client.

2.2.3. Key Characteristics

Regardless of the type, every EPC defined under the revised EED is required to comply with a common set of legal and operational requirements that cannot be waived or circumvented. These include:

Table 2. Core characteristics of EPCs

Key characteristic	Description
Performance-based remuneration	Payments to the ESCO are directly linked to a contractually agreed level of EE improvement or other agreed performance criteria.
Guaranteed savings	The ESCO provides a legally binding guarantee for a minimum level of energy savings and is contractually obligated to compensate for any underperformance.
Risk allocation	Technical and performance risks are transferred to the ESCO, which is responsible for ensuring that the implemented measures deliver the expected results.
Measurement and verification (M&V)	Robust procedures are required to monitor and verify achieved savings against a pre-established baseline throughout the contract period, ensuring transparency and underpinning the payment and guarantee mechanism.
Financing linked to savings	Financing can be provided by the ESCO, the EPC client, or a third party, but investments are repaid through future verified energy or cost savings following a “spend-to-save” logic that limits the need for upfront capital.
Turnkey delivery	The ESCO typically provides a comprehensive service package covering project design, implementation, operation, and often long-term maintenance, ensuring coherence across all energy-saving measures.
Medium- to long-term horizon	EPC contracts generally span 6–15 years (and in some cases up to 20 years), allowing capital costs to be recovered through the ongoing stream of energy savings[3].

Focus Box 3: Performance targets in EPC

EPC defines the results the ESCO is contractually required to achieve and guarantee over the contract duration. Depending on the project scope, performance targets may be expressed through one or more of the following indicators:

- Energy savings, measured as a reduction in final or primary energy consumption.
- CO_2 emissions reductions, reflecting avoided emissions against the agreed baseline.
- RES generation, defined as the delivery of a specified annual output (kWh) from on-site or integrated RES systems.

In some national contexts, such as France, additional performance commitments may also be included, such as indoor air quality or lighting level requirements. In all cases, the final selection and combination of the specific targets vary by EPC model and sector, but remain subject to the applied M&V procedures and underpin performance-based payments.

[3] Short-term EPCs (typically 2–3 years) are used for low-investment projects, while durations of 1–5 years are common in commercial EPCs with limited upgrades, reflecting client preferences for rapid payback and internal ROI requirements(ClimACT., 2020; Institute for Building Efficiency, 2015).

2.3. Why EPC matters: Benefits and added value for LRAs

At present, EPC has evolved into a strategic governance and financing tool that delivers a "win-win" value proposition across sectors. By focusing on long-term, guaranteed performance outcomes rather than isolated EE measures, it enables asset owners and operators to achieve energy and operational improvements while transferring significant technical and financial risks to specialised ESCOs.

In practice, the scheme supports comprehensive infrastructure and system upgrades without requiring major upfront investment, helping address maintenance and renovation needs through a self-financing, performance-based approach. For public authorities in particular, it provides a practical mechanism for accelerating the energy transition by transforming future energy savings into immediate investment capacity (BPIE, 2025a, 2025b; European Commission, 2025; Maduta et al., 2025; Todeschi et al., 2025).

The main added value and benefits of EPC across its financial, operational, environmental, and strategic dimensions are summarised in Table 3.

Table 3. Added value and key benefits of EPC across sectors and dimensions

Dimension	EPC added value	Key EPC benefits
Financial sustainability (Economic benefits)	Guaranteed and predictable savings	Provides a contractually guaranteed reduction in energy costs, with the ESCO legally bound to compensate for any shortfall.
	Limited or no upfront capital expenditure	Allows for significant energy efficiency upgrades without the need for immediate, large capital expenditures (CAPEX), freeing up available budget for other priorities.
	Mobilisation of private capital	Attracts private investment from ESCOs and/or other financing sources (e.g. banks, funds) leveraging market resources to finance public and mixed-ownership infrastructure.
	Reduced operating costs	In addition to energy savings, modern, efficient equipment and optimised controls lower ongoing operational expenditures (OPEX), reducing the need for unplanned maintenance and/or emergency repairs.
Risk mitigation & capacity support	Risk transfer	Explicitly allocates technical, financial, and performance risks to the ESCO, with the EPC client's exposure to project failure or underperformance being significantly reduced.
	Single point of accountability	With its turnkey nature, EPC streamlines procurement, with the ESCO serving as the single provider responsible for all phases of the project delivery.
	Access to specialised expertise	Bridges in-house "capacity gaps" in complex project delivery by providing access to ESCO technical expertise.

Strategic asset management & long-term planning	Systematic energy and performance management	With the M&V processes embedded in EPC, a culture of data-driven energy management is introduced within organisations.
	Long-term planning	Medium- to long-term EPC contract duration, encourages broader climate and energy action planning (over short-term measures implementation).
	Incentives for innovation	Risk allocation incentivises the delivery of innovative high-performing solutions, "shielding" EPC client from any technical or performance uncertainty.

Overall, the benefits of EPC extend beyond energy savings alone, generating important value both at the project and institutional levels. These mainly include:

Project-level value creation. EPC enables a shift beyond incremental upgrades towards comprehensive modernisation of public assets and services through:

- Renovation and energy performance improvement of ageing public infrastructure and systems.
- Improved quality, reliability, and continuity of public services.
- Enhanced comfort, functionality, and usability of public spaces and buildings.
- Long-term performance optimisation supported by continuous M&V procedures ensuring that savings and improvements are maintained over time.

Institutional and strategic value creation. Beyond individual projects, EPC also acts as an enabling mechanism for climate governance and policy implementation by:

- Supporting cross-departmental coordination and integrated decision-making within public administrations.
- Facilitating structured long-term energy and climate planning beyond isolated short-term interventions.
- Enabling the delivery of measurable and verifiable energy and CO_2 reductions aligned with long-term national and/or local and regional strategies (such as NBRPs, SECAPs or other similar),
- Supporting compliance with EU policy objectives and legislative frameworks, under frameworks such as the EED 2023/1791 and the EPBD 2024/1275 .

For public authorities, EPC goes beyond technical implementation; it offers an integrated governance mechanism that helps turn climate and energy goals into coordinated and accountable action and setting a powerful example of scalable solutions for the wider public sector.

2.4. Sector-wide applications: When and where EPC can be used

EPC tends to be most suitable and viable in situations where:

- Significant and quantifiable energy saving potential exists.
- Baseline energy consumption can be accurately measured and verified.
- Technical measures can be effectively monitored and maintained over a multi-year EPC contract.
- The asset owner is willing and/or committed to enter into such a contractual relationship.
- The project scope and structure allow for risk transfer.

Under these conditions, EPC can be applied across a broad range of sectors and project types, as summarised in Table 4, with public buildings and street lighting traditionally representing the most common application areas.

Table 4. Typical EPC application contexts and project types by sector

Sector	Typical EPC contexts	Typical EPC project types
Public buildings	• MUSH sector buildings (Municipalities, Universities, Schools, and Hospitals) • Cultural and community facilities (libraries, museums, theatres, sports facilities) • Publicly owned or managed social housing	Large-scale renovation and optimisation projects covering: • HVAC system upgrades, building management and control systems, • lighting upgrades, insulation • envelope improvements, • on-site RES systems • other energy-related installations and services, depending on asset type and scale
Private buildings	• Commercial and industrial facilities • Multi-apartment residential buildings including privately or mixed-owned social housing • Housing associations and condominium portfolios	
Public lighting & smart infrastructure	• Street lighting networks • Public space lighting (e.g. car parks and sports facilities) • Integrated smart-city infrastructure such as EV charging systems, 5G small cells, and urban sensors	Large-scale lighting renovation and optimisation projects covering: • energy-efficient luminaires, • smart control systems, • integrated digital and energy services delivered under a single performance-based contract.
Transport & mobility	• Public transport hubs, • EV charging networks, • Infrastructure supporting green and low-emission logistics corridors	EE and decarbonisation projects covering: • infrastructure and operational optimisation at transport facilities, • traction power optimisation, • smart charging and load management systems, • on-site RES integration and storage, • fleet-related measures such as vehicle electrification.

Water & waste management	• Wastewater treatment plants, • Desalination facilities, • Water pumping stations, and related utility infrastructure	EE and decarbonisation projects covering: • optimisation of treatment and pumping processes, • deployment of high-efficiency motors and drives, • advanced process control systems, • biogas recovery and utilisation from wastewater and/or organic waste streams, where applicable.
Industrial & energy technology assets	• Manufacturing plants, • Energy-intensive industrial processes, and emerging clean-energy infrastructure such as green hydrogen production and storage.	Process-level EE and decarbonisation projects covering: • industrial system optimisation, • waste heat recovery and process electrification, • digital solutions such as AI-driven analytics and predictive maintenance to improve operational efficiency, reliability, and energy performance.

In addition to the above sectoral categories, EPC can also be applied through cross-sectoral and specialised arrangements that span multiple asset types or apply innovative delivery models, such as energy communities, collective schemes, and aggregated portfolio-based projects. These approaches are particularly relevant where individual assets are too small or fragmented for standalone EPC, but become viable when bundled under a single contractual and financing framework. In such contexts, EPC can support coordinated investments in EE, RES generation, energy management systems, and digital solutions across multiple buildings, facilities, or actors, with typical applications including:

- Renewable Energy Communities (RECs) and other citizen- or municipality-led structures.
- Collective self-consumption schemes, enabling shared generation and use of renewable energy.
- Aggregated or bundled EPC projects, covering portfolios of assets.
- Multi-site EPC programmes, implemented across departments, sectors, or jurisdictions.
- Hybrid EPC models, combining energy efficiency, renewables, storage, and flexibility services.

2.5. Main stakeholders involved

An EPC is a multi-actor ecosystem requiring the coordinated involvement of technical, financial, legal, and administrative stakeholders. In line with the EED (EU) 2023/1791 and guidance from the European Investment Bank (2018), EPC stakeholders can be grouped into:

- Core actors, directly bound by the EPC contractual and performance obligations.
- Enabling actors, supporting the structuring, financing, implementation, and monitoring of the EPC arrangement.
- Supporting or secondary actors, contributing indirectly to implementation, coordination, market facilitation, or wider system integration.

Table 5. Actors involved in a typical EPC arrangement

Direct EPC actors		
Functional category	Key stakeholders	Role in the EPC
Core actors	EPC client (asset owner/operator or contracting authority)	Defines project objectives and commits to the agreed multi-year payment structure based on verified performance.
	EPC provider (ESCO)	Designs and implements the measures, assumes technical and performance risk, and guarantees the agreed savings.
Enabling actors	Financial institutions, third-party financiers, EPC funds	Provide financing and support project bankability and financial structuring.
Direct EPC actors		
Functional category	Key stakeholders	Role in the EPC
Supporting / administrative actors	Governmental and regulatory bodies	Establish the regulatory and policy framework enabling implementation.
	Energy agencies, EPC facilitators, independent advisors	Provide technical assistance, including standardised tools, market facilitation, and capacity building.
	Internal cross-departmental teams	Support coordination, procurement, and project implementation within the EPC client organisation.
Supporting /systemic actors	Aggregators	Bundle projects or assets to improve project scale and financial viability.
	Utilities and grid operators	Enable grid integration, flexibility services, and interaction with the wider energy system.
	Equipment suppliers and vendors	Provide technologies, equipment, and technical solutions supporting the EPC delivery.

In many EPC projects, particularly in MUSH sector buildings, the behaviour and engagement of end users can significantly influence the achievement and maintenance of guaranteed savings. Although users are not contractual parties to the EPC arrangement, they can act as supporting/operational actors, as effective cooperation between facility occupants, building managers, and the ESCO is often essential to support the long-term operational performance of the implemented measures.

Focus Box 4: Key EPC roles at a glance

1. Direct vs. Indirect actors: The "contractual line"

- Direct actors are inside the EPC “transaction loop”. If the agreed energy savings are not achieved, these actors are immediately impacted financially.
- Indirect actors operate outside the EPC contract. They may benefit from the existence of a project or help facilitate its implementation, but they do not bear financial losses if the project underperforms.

2. Strategic Insight: The “shifting” role of the aggregator

Aggregators’ role and positioning within an EPC ecosystem may shift across categories depending on the business model applied.

- In a conventional EPC, they typically play a supporting role by bundling smaller projects to achieve scale and facilitate tendering, without assuming performance risk.
- In an advanced EPC they may take on a core/direct role by contracting directly with counterparties, managing multiple ESCOs, (“Super ESCO”) and assuming primary performance risk across a portfolio of sites.

3. Setting up an EPC: A quick step-by-step guide

Setting up an EPC may appear complex at first, but in practice it follows a well-structured, modular process that supports EPC practitioners in designing technically sound, financially viable, and capable of delivering guaranteed performance outcomes energy projects. While specific procedures may vary across countries and sectors, the European guidance - in line with the EED (EU) 2023/1791 and the European Investment Bank frameworks (2018) - identifies a logical progression of phases and steps that underpin most EPC projects, from early project preparation through procurement, implementation and long-term monitoring.

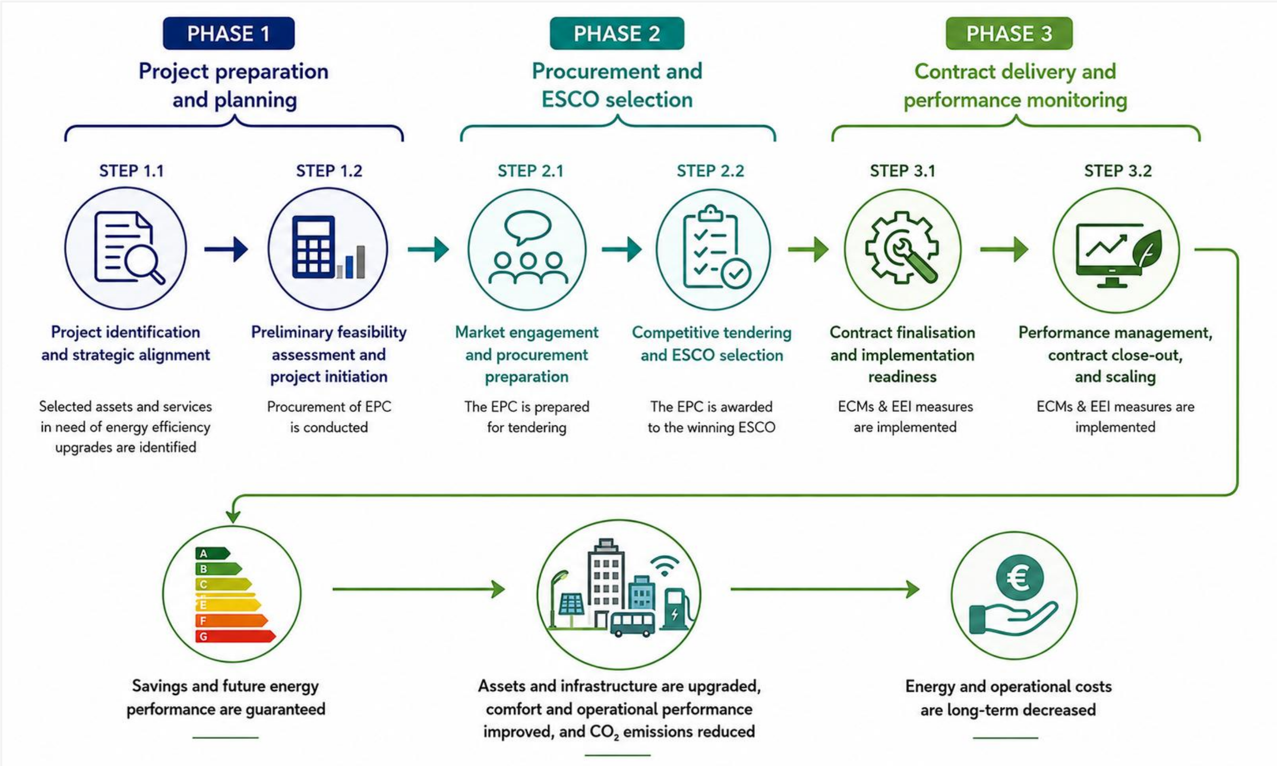

Figure 3. Indicative overview of the main phases and steps of an EPC project in the public sector

The following section brings these together into a practical reference to help public authorities and other practitioners navigate EPC implementation with confidence.

3.1. Phase 1: Project preparation and planning

Phase 1 establishes the foundations of a successful EPC project, focusing on early project identification, strategic alignment, and preliminary feasibility. It enables EPC clients to: (i) clarify objectives, (ii)confirm the suitability of EPC as a delivery and financing mechanism, and (iii) build the internal alignment and analytical evidence needed to progress towards procurement in subsequent phases.

Step 1.1 – Project identification and strategic alignment

The step establishes the strategic intent, project boundaries, and the EPC-eligible assets or services, while confirming the suitability of EPC as a delivery and financing mechanism. Internal alignment and decision-making readiness are also consolidated at this stage.

The EPC client establishes the scope and the strategic objectives (technical and financial) of the project, reviews its contextual prerequisite - such as current energy use patterns, savings potential, and organisational readiness - and assesses alignment with the broader policy frameworks such as SECAPs, climate strategies, or asset management plans. In parallel, internal coordination is strengthened and the necessary organisational commitment to proceed with the EPC project is secured.

This initial screening typically includes:

- Internal buy-in alignment, including confirmation of leadership support and prioritisation of expected outcomes such as energy savings, cost reduction, and CO_2 mitigation.
- Preliminary suitability assessment, including the identification of eligible assets/services, estimated savings potential, budgetary constraints, and organisational capacity to manage EPC.

Step 1.2 – Preliminary feasibility assessment and project initiation

This step turns the initial idea into a well-defined project giving potential bidders a clear understanding of what is expected and how the EPC will be structured. Here, a preliminary feasibility and baseline analysis is carried out to ensure a bankable project.

At this stage, the EPC client typically commissions preliminary energy audits to establish a robust baseline and evaluate key parameters such as: (i) asset condition, (ii) operational constraints, (iii) expected payback periods, and (iv) risk factors. The analysis helps confirm that projected savings are sufficient to support the EPC cash-flow logic, while also refining the project scope and the future performance and risk allocation requirements.

Practical tools supporting Phase 1. Phase 1 can be supported by a range of practical including:

- Structured methodologies[4] and international standards[5] for energy management, baseline definition, and performance tracking.

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[4] Although not EPC-specific, EU-level annotated templates for NBRPs offer useful examples for early EPC data collection and baseline definition.
[5] Indicative example: The ISO 50001 Energy Management Systems standard, providing a framework for defining project boundaries, significant energy uses and organisational energy policy.

- Mini-audit worksheets[6] for technical assessments, asset inventories, and preliminary financial feasibility analysis.
- Baseline calculation templates[7] supporting transparent and credible savings estimation.
- Screening and assessment tools[8] designed under EU-funded projects and/or relevant initiatives.
- Procurement support tools and EPC facilitator toolkits helping EPC clients navigate pre-procurement technical, legal, and financial requirements.

To complement the practical resources outlined above, a simplified step-by-step roadmap summarising the main actions required to transform an initial idea into a feasible and procurement-ready EPC project capable of progressing to the next implementation phase, is illustrated in Figure 4.

Figure 4. Simplified roadmap for Phase 1 EPC project preparation and planning

[6] Indicative example: The ESPC Program Kick-Off Worksheet developed by the Energy Services Coalition (ESC), supporting structured initial data collection on energy use, assets, objectives, and organisational readiness.
[7] Indicative example: The Support Scheme for Energy Audits (SSEA) developed by the Sustainable Energy Authority of Ireland (SEAI) supporting rapid baseline estimation and preliminary savings identification for SMEs and eligible public entities (e.g. small public bodies).
[8] Indicative example: The Buildings Energy Efficiency Calculator (BEEC), developed under the EUROCLIMA+ initiative supporting municipal building portfolio screening or the EPC PreCheck tool developed under the guarantEE project helping EPC clients (building owners) assess EPC suitability.

3.2. Phase 2: Procurement and ESCO selection

Phase 2 moves the EPC project from preparation to market engagement, focusing on procurement design, tender preparation, and the transparent selection of an ESCO. It enables EPC clients to: (i) translate pre-feasibility results into well-defined tender documentation, (ii) engage the market effectively, and (iii) apply value-driven evaluation approaches to identify the most advantageous offer.

Step 2.1 – Market engagement and procurement preparation

Once pre-feasibility is confirmed, the EPC client prepares internally for organising and ensuring a bankable procurement process. This phase marks the transition from initial project planning to market-facing activities, including the interaction with potential EPC providers.

At this stage, the EPC client translates the pre-feasibility assessment results into a robust procurement strategy and prepares the necessary tender documentation, including the contractual structure, performance guarantees, risk allocation, M&V requirements, and payment mechanisms, in a manner that ensures bankability, market clarity, and ultimately the attraction of qualified and competitive ESCOs. Typically, the process aligns with national procurement rules, with long-term EPC procurement procedures in many cases falling under Public-Private Partnership (PPP) frameworks, which may however introduce additional procedural and contractual requirements (EIB, 2021).

To manage any technical complexity, many EPC clients engage EPC facilitators or external advisors, with the cost often covered through EU grants under the ELENA programme. This is particularly relevant for smaller or fragmented assets, where aggregation strategies are often introduced to unlock economies of scale, reduce unit costs, and enable project eligibility for EU technical assistance mechanisms. Other activities may include:

- Early appointment of a core team and definition of internal roles to ensure coordination across technical, legal, procurement, and financial departments.
- Securing senior management commitment to ensure internal approvals and alignment with organisational decision-making and budget cycles, given the multi-year nature of EPC projects.
- Development of a project timetable aligned with the selected procurement route, especially where long contractual negotiations or "Competitive Dialogue"[9] processes are applied.

[9] The "Competitive Dialogue", as defined in the EU Public Procurement Directive (2014/24/EU) is applied to complex EPC projects, where technical or financial solution cannot be defined upfront. Procedural guidance is available on the EIB/EPEC Competitive Dialogue Report on the procurement practices in Europe (EIB, 2011) and the European Commission's Public Procurement Guidance for Practitioners (European Commission, 2015).

Practical tools supporting step 2.1. Apart from the EU guidance on public procurement (European Commission, 2015; EIB, 2011) many sources of practical tools are available to support EPC clients in structuring and effectively progressing in this Step. These are often developed and provided by public bodies, specialised organisations, and dedicated networks at all levels, and include among others:

- Standardised governance structure templates including proven tender documentation and stablished EPC contract model[10] that offer a ready-to-use framework to streamline procurement preparation, mitigate contractual and financial risks and enhance bankability and market confidence among ESCOs and financing institutions.
- Strategic procurement toolkits that guide the selection of optimal tendering routes and timelines[11], ensuring the process is tailored to project complexity, asset profiles, risk allocation between the EPC client and the ESCO, and current market capacity and interest, while remaining fully compliant with EU procurement directives.
- Management workflow frameworks, including decision-making[12] and stakeholder mapping tools for providing a structured roadmap to align internal departments, secure senior-level approval, and ensure the project is fully market-ready for attracting high-quality ESCO bids.

Step 2.2 – Competitive tendering and ESCO selection

During this step, the procurement process is launched and ESCOs are invited to submit their proposals. The focus is on comparing the ESCO's offers and identifying the most resilient and economically advantageous one.

Bid evaluation is carried out against predefined technical, financial, and performance-related criteria, typically covering the level of guaranteed savings, life-cycle costs, financing conditions, proposed technical solutions, risk allocation, and the bidder's implementation and management capacity. For complex EPC projects, procedures such as "Competitive Dialogue" or negotiated procedures may be applied, where permitted, to refine solutions and contractual terms before final offers are submitted.

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[10] Indicative examples: The EU level Standardised Smart EPC contract and tender documentation and the Global ESCO Network's ESCO Model Contract Library provides EPC contract models, tender templates and procurement guidance based on established international practice.

[11] Indicative example: Guidance and tools from competent energy agencies such as the German Energy Agency (dena), the Netherlands Enterprise Agency (RVO), the Austrian Energy Agency (AEA) and the Belgian Federal Energy Services Company (Fedesco), together with Energinvest and EU-funded initiatives such as the Qualitee, the Transparense and the EFFECT4building projects, support the technical and legal pre-procurement phase and help assess the suitability of EPC delivery models.

[12] Current EPC decision-making tools and methodologies combine multi-criteria approaches, such as Analytic Hierarchy Process (AHP) models, with structured "Go/No-Go" decision logic or a Plan-Do-Check-Act (PDCA) cycle embedded in phased readiness assessments, to support procurement decisions (Li, 2022; Moles-Grueso et al., 2023; Y. Yang et al., 2025).

Throughout this stage, the principles of transparency, equal treatment, proportionality, and value for money remain central, safeguarding public accountability and legal compliance.

Practical tools supporting step 2.2. Recognising that higher-quality solutions may deliver superior long-term benefits, current EPC practice promotes the integrated use of standardised evaluation and operational tools to move beyond simple cost-based selection towards a strategic value-driven procurement model. This ensures that complex factors - such as technical innovation, long-term carbon performance, and digital intelligence - are also quantified alongside financial metrics (European Commission, 2015; Moles-Grueso et al., 2023).

In terms of evaluation, EPC procurement increasingly relies on structured multi-criteria frameworks that assess tenders against both quantitative and qualitative performance dimensions, including:

- Best Price–Quality Ratio (BPQR) scoring, which replaces the "lowest price" approach by assessing tenders against a weighted combination of cost and qualitative criteria. This allows for prioritising guaranteed energy savings, technical robustness, innovation, and life-cycle value over initial investment cost alone [13].
- Performance guarantee and savings credibility assessment, evaluating the depth, reliability and soundness of the proposed energy savings and the underlying assumptions as well as bidder's alignment with recognised M&V protocols, such as the IPMVP[14].

In terms of operational tools, practical instruments that support transparency, risk management, and defensibility throughout the procurement process are commonly applied, including:

- Structured compliance and risk checklists for verifying that bidders meet all legal, financial, and technical "off-balance sheet" requirements (Eurostat & European Investment Bank, 2018).
- Weighted scoring matrices help translate qualitative and quantitative criteria into a final score for the ESCO selection (World Bank, 2023, 2025).
- Life-cycle cost (LCC) assessment tools calculate and compare bids in terms of total cost of ownership over the contract duration - modeling energy, maintenance, and CO_2-related costs - rather than upfront investment alone (ICLEI, 2018).

[13] Higher weightings place on quality and performance (e.g. 60–70%) than on price help determine the Most Economically Advantageous Tender (MEAT) (European Commission, 2015; Eurostat & European Investment Bank, 2018).

[14] Tools such as the Effect4Buildings tender documents, templates, and checklists for qualification and award criteria, - as well as the corresponding Qualitee checklist - can support the qualitative assessment of ESCOs' technical and performance claims. In addition, the EVO M&V protocols and guiding documents helps ensure that bids are structured in line with IPMVP principles, supporting transparent and consistent reporting.

3.3. Phase 3: Contract delivery and performance monitoring

Phase 3 covers contract delivery, performance management, and long-term value realisation, translating contractual commitments into implemented measures, verified performance, and sustained operational results. It focuses on: (i) implementation readiness, (ii) ESCO-led delivery under client oversight, and (iii) systematic performance monitoring to ensure contractual compliance, optimise outcomes over time, and scaling or replication of the EPC solutions.

This phase is ESCO-led; The ESCO executes and delivered the agreed activities, while the EPC client retains a supervisory and approval role to ensure full compliance with contractual obligations. It requires therefore effective coordination, oversight and clear communication among the contractual parties.

Step 3.1 – Contract finalisation and implementation readiness

Once the ESCO is selected, the EPC procurement process is finalised. This step represents the formal commitment of all parties and enables implementation activities to commence.

At this stage, EPC client and the ESCO translate the selected offer into a binding agreement by finalising key contractual provisions, including (i) performance guarantees, (ii) savings calculation methodologies, (iii) M&V plans, (iv) payment mechanisms, and (v) reporting obligations. In addition, clear allocation of risks and responsibilities between the EPC client, the ESCO, and any third-party financiers, as well as financing arrangements are confirmed in line with the EPC cash-flow logic[15]. These elements provide contractual clarity - confirming that all legal, financial, and administrative conditions are in place - and ensure readiness for the delivery of the agreed package of energy upgrade measures.

In practice, this step typically encompasses the following activities:

- Detailed design and planning, where the ESCO completes the technical design based on site surveys and prepares the implementation timetable.
- Equipment installation and commissioning, during which systems are installed and commissioned to verify compliance with contractual performance requirements.
- Training of operational staff (or end-users) to ensure effective operation and sustained performance of the installed systems.

[15] Depending on the selected model, funding may be provided by the ESCO, the EPC client, third-party financiers, or a combination thereof, potentially complemented by public support mechanisms (Section **Error! Reference source not found.**).

Practical tools supporting step 3.1. Step 3.1 is supported by oversight tools that ensure technical compliance, digital integration, and operational readiness. While applied by the ESCO during delivery, they remain overseen by the EPC client to safeguard contractual conformity and "quality of result".

- Design management frameworks and methodologies[16] that enable the EPC client to oversee the installation and commissioning, ensuring that approved technical specifications are accurately delivered on-site without any performance drift.
- Measurement infrastructure standards and technical protocols[17] to ensure that technical infrastructure for later performance tracking is robustly established.
- Technical training and capacity-building equipping end-user operators with the maintenance and digital skills required to manage the newly installed measures.

Step 3.2 – Performance management, contract close-out and scaling

This final EPC step focuses on verifying long-term performance, concluding the contractual arrangement, and using validated results to optimise, replicate or scale up future EPC actions across asset portfolios. In line with current practice, automated verification and replication toolkits are increasingly prioritised.

Throughout the contract period, the full set of contractually guaranteed performance outcomes - energy, CO_2, and operational savings - are monitored in line with the agreed M&V plan, and verified results underpin performance-based payments or may trigger corrective actions in cases of deviations from contractual guarantees. As the EPC reaches maturity, optimisation activities supported by advanced digital monitoring and data-driven asset management help prevent any performance degradation and ensure sustained operational reliability of the installed measures over time.

At the contract expiry - once the investment has been fully recovered - the EPC is formally closed out through a structured technical handover, and all subsequent energy and cost savings accrue fully to the EPC client, who assumes full operational control of the upgraded, future-proofed assets. At this stage performance data and lessons learned may provide a robust evidence base to inform portfolio-wide scaling and project aggregation or replication through wider programme-based deployment.

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[16] Indicative example: Replicable methodologies such as the EXEED Certified grant and the associated management framework checklist by SEAI, support structured client oversight of installation and commissioning.

[17] Indicative example: Protocols such as the ISO 50015 define requirements for the correct placement, calibration, and verification of metering and monitoring infrastructure during installation, serving as a common reference for the ESCO implementation and the EPC client (or a third-party) inspection and sign-off prior to the start of the performance period.

Practical tools supporting step 3.2. The successful implementation of this step relies on an integrated suite of dynamic performance-tracking and scaling resources, with each one serving a specific role in ensuring long-term project accountability (IEA, 2025). These may include:

- Real-Time performance and monitoring dashboards[18] that can provide centralised, continuous visibility into energy savings and the operational smartness of the assets, ensuring that performance-based targets are transparently tracked.
- Advanced digital monitoring and data-driven asset management tools[19] using analytical systems and virtual modeling software to prevent performance degradation and extend asset lifecycles through proactive oversight.
- Dynamic baseline and savings reconciliation tools[20] that employ automated calculation engines to adjust baselines dynamically, ensuring, ensuring performance guarantees are reconciled against actual operational conditions.
- Replication, scaling, and aggregation toolkits[21] serving as strategic resources that enable clients to benchmark results against EU-wide data and structure future large-scale portfolios.
- End-of-contract handover and management checklists[22] based on recognised frameworks and standards facilitate technical transfer and ensure the client retains full operational control of the upgraded assets.

[18] Indicative example: The Eurac M&V Web Application supports IPMVP Option C whole-facility M&V through statistically robust baseline modelling and real-time comparison of predicted and actual energy consumption, enabling transparent performance tracking and contract close-out.
[19] Indicative example: Predictive maintenance programmes and digital twins are progressively integrated into performance tracking practices to enable advanced monitoring, real-time system analysis, and proactive operational optimisation (Fokaides & Klumbyte, 2024).
[20] Indicative example: The RETScreen Expert is a clean energy management software provided by the Government of Canada and is widely used in EPC projects for feasibility analysis, performance modelling, and ongoing performance tracking.
[21]The EPC ATLAS under the SmarterEPC project serves as an EU-wide repository of energy performance and smart assessment tools, enabling benchmarking, replication, and transparent project aggregation.
[22] Indicative example: Frameworks such as the ISO 50015 and EXEED Certified grant support EPC contract close-out by providing structured checklists and management processes that facilitate the transition from ESCO-led performance to client-led operation, ensuring that upgraded assets are handed over with the documentation, skills, and procedures needed to sustain long-term energy savings.

4. Case studies

This section presents three illustrative case studies showing how EPC has been applied in different public-sector contexts. Together, they highlight common EPC features such as guaranteed savings, ESCO-led delivery, structured M&V procedures, and long-term operational and financial benefits.

4.1. EPC-based public building renovation in Bergamo (Italy)

GENERAL CONTEXT. The City of Bergamo implemented a 10-year EPC scheme covering approximately 160 public buildings, combining energy services, refurbishment measures, and long-term maintenance activities. The project was designed to reduce energy consumption through guaranteed savings while modernising the municipal building stock and improving operational efficiency.

HOW EPC WAS APPLIED. The EPC combined refurbishment works with long-term performance guarantees linked to verified energy savings. Measures focused primarily on reducing methane and district heating consumption, while the financial structure also integrated co-financing through the Italian national incentive scheme "Conto Termico 2.0".

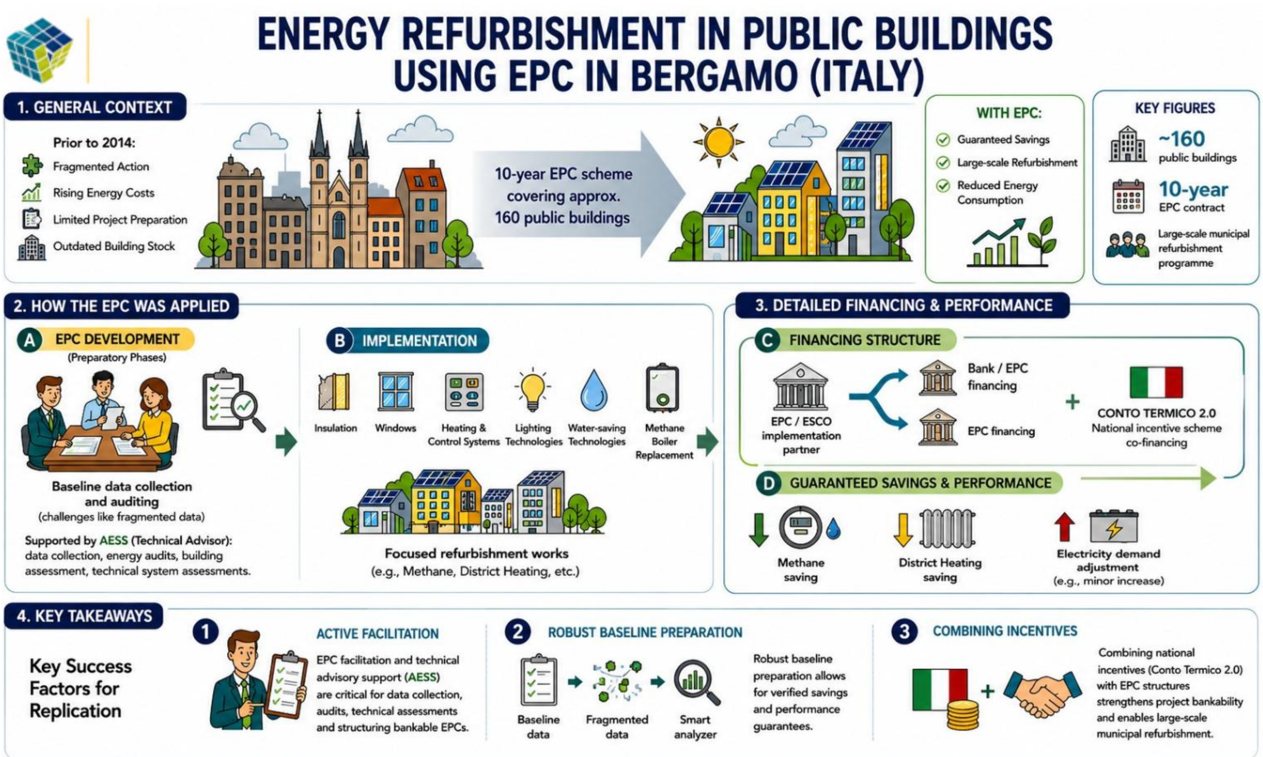

Figure 5. Energy refurbishment in public buildings using EPC in Bergamo (Italy)

During project preparation, the municipality was supported by AESS acting as a technical advisor and EPC facilitator. The agency assisted with data collection, energy audits, and technical system assessments, helping structure a bankable EPC process despite limited baseline data availability.

Key Takeaway. The Bergamo experience highlights the importance of EPC facilitation services and robust baseline preparation, particularly for large public-sector portfolios where energy data may be fragmented or incomplete. The case also demonstrates how national incentives can be combined with EPC structures to strengthen project bankability and support large-scale municipal refurbishment programmes.

Read more about this practice. For deeper insights on the EPC application in Bergamo, find and download the case study factsheet on the PROSPECT Stories webpage.

For further information on the supporting agency's broader role in sustainable energy management visit the official AESS website.

4.2. EPC in Maribor (Slovenia)

General context. In 2018, the Municipality of Maribor implemented an EPC scheme covering 24 energy-inefficient public buildings, including schools, kindergartens, administrative buildings, and sports facilities. The project aimed to deliver comprehensive energy renovation measures while improving indoor comfort, reducing operating costs, and integrating renewable energy solutions.

How EPC Was Applied. The EPC project combined building envelope improvements, heating system upgrades, LED lighting installation, renewable energy integration, and energy management measures.

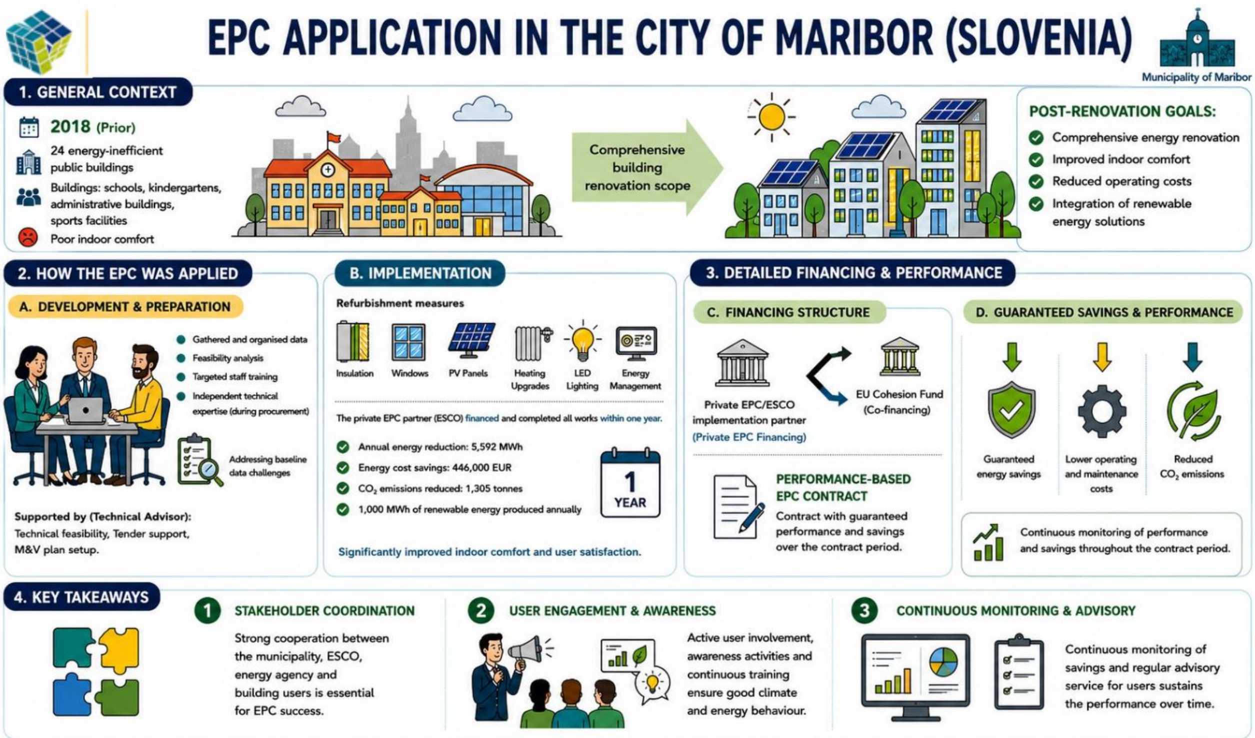

Figure 6. EPC application in the city of Maribor (Slovenia)

The private EPC partner financed and completed the refurbishment works within one year under a performance-based contractual structure, while strong emphasis was placed on user involvement, awareness-raising, and continuous monitoring throughout implementation. Cooperation between the municipality, ESCO, energy agency, and building users was considered essential to achieving and maintaining the targeted energy savings over the contract period.

Key Takeaway. The Maribor case demonstrates that EPC success depends not only on technical upgrades, but also on effective stakeholder coordination, user engagement, and continuous monitoring of building performance. The project also illustrates how EPC can support rapid implementation of large-scale public building renovations while delivering measurable energy, financial, and environmental benefits.

Read more about this practice. For deeper insights on the EPC application in Maribor, find and download the case study factsheet on the PROSPECT Stories webpage.

For further information on the supporting agency's broader role in sustainable energy management visit the official ENERGAP website.

4.3. EPC in Litoměřice (Czech Republic)

General context. The City of Litoměřice implemented an EPC project covering 11 municipal buildings, including schools, sports facilities, cultural venues, and office buildings. Developed between 2014 and 2026, the project aimed to modernise a portfolio of public assets through guaranteed energy savings while limiting pressure on the municipal budget.

How EPC Was Applied. The EPC focused primarily on heat savings through the optimisation of heat sources and control systems, complemented by energy-efficient lighting, water-saving technologies, and specialised upgrades in energy-intensive facilities such as swimming pools and winter stadiums. The financing structure combined national grant support with ESCO participation.

The municipality supported implementation through comprehensive feasibility analysis, independent technical expertise during procurement, clear allocation of operational responsibilities, and targeted staff training. Robust M&V procedures and automated monitoring systems were also applied to ensure long-term performance and transparent verification of guaranteed savings.

Key Takeaway. The Litoměřice experience demonstrates the importance of combining technical preparation, independent expertise, and operational capacity-building within EPC implementation. The project highlights how strong governance structures, staff engagement, and transparent performance monitoring can significantly reduce technical and organisational risks while supporting long-term energy savings.

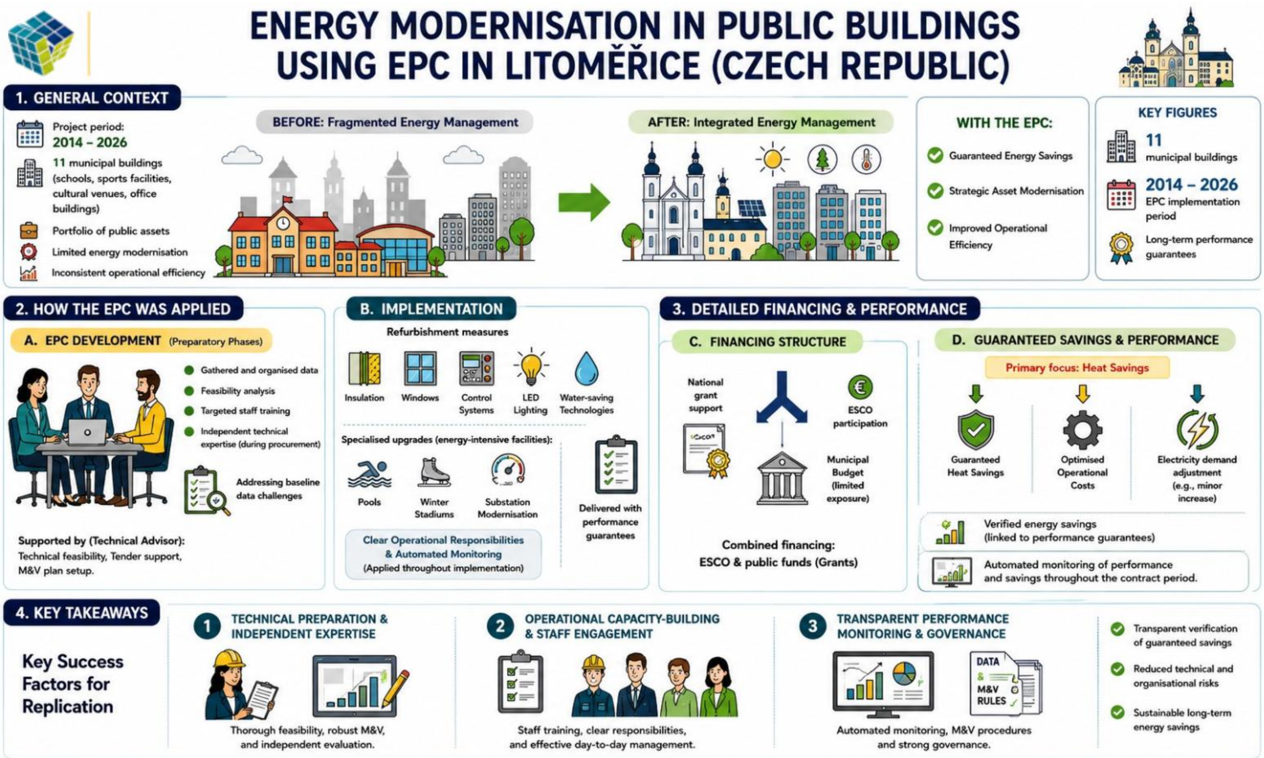

Figure 7. EPC application in Litoměřice (Czech Republic)

Read more about this practice. For deeper insights on the EPC application in Litoměřice, find and download the [case study factsheet]() on the [PROSPECT Stories webpage]().

For further information on the supporting agency's broader role in sustainable energy management visit the official [SEMMO website]().

PROSPECT initiative empowers LRAs to finance and implement sustainable energy and climate actions through capacity building, peer learning and access to a dedicated EU-wide repository of success Stories.

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5. Critical conditions influencing EPC implementation

The effective implementation of EPC relies on a combination of favourable framework conditions, institutional preparedness, and market capacity, together with the ability of EPC clients and stakeholders to anticipate and manage organisational, contractual, and financial challenges throughout the project lifecycle. These factors are essential for structuring realistic projects, allocating responsibilities effectively, and ensuring the bankability, scalability, and long-term performance of EPC schemes in supporting local energy transition investments.

5.1. Drivers and success factors

A number of enabling factors and conditions may influence EPC adoption and outcomes such as:

- Contextual and policy drivers, referring to supportive regulatory frameworks, energy policy incentives, and clear guidance that reduce uncertainty and signal long-term commitment to efficiency goals, improving market confidence.
- Contract design and clarity, including clearly defined contractual provisions, robust baseline definitions, and well-structured M&V protocols that help align expectations, reduce ambiguity, and strengthen investor confidence.
- Internal organisational capacity, including leadership commitment, dedicated project teams, and internal awareness of EPC benefits, which are often decisive factors enabling project progression.
- EPC facilitation services, referring to the availability of EPC facilitators, external advisors, and dedicated technical assistance services for LRAs supporting project preparation, procurement, aggregation, and market engagement.
- Stakeholder dynamics and collaboration, involving effective engagement among governments, clients, ESCOs, and financiers, with agreed risk allocation and shared objectives fostering smoother implementation.

5.2. Barriers and limitations

EPC implementation may be constrained by internal and external barriers, often including:

- Limited familiarity with EPC models, insufficient technical expertise or managerial capacity, and difficulties associated with long payback expectations, particularly in conservative budget environments.

- Ensuring long-term internal ownership and continuity of project responsibility throughout the EPC lifecycle may also prove challenging, especially in cases of staff turnover or changing administrative priorities.
- Contractual and procurement challenges, including complex contractual structures, unclear risk allocation, inefficient internal governance, and the absence of standardised EPC templates or procedures, which can increase transaction costs and hinder effective project implementation and replication across sectors.
- Unfavourable economic and market conditions, fluctuating energy prices, baseline uncertainties, and high transaction costs, may deter EPC uptake.
- Weak policy incentives, regulatory ambiguity, or cultural resistance to long-term performance-based contracts may further limit adoption.

5.3. Key risk dimensions

EPC projects involve intertwined internal and external risks, which must be addressed through governance and contractual design. In terms of internal risks, these may include:

- Technical performance risk, relating to baseline estimation uncertainties, technology performance shortfalls, or measurement issues that may jeopardise contracted savings.
- Organisational risk, including ineffective internal coordination, lack of stakeholder alignment, or insufficient leadership engagement that may impede implementation.
- Contractual risk, arising from variability in contract terms, lack of standardisation, and unclear risk allocation, potentially leading to disputes or performance gaps.
- Financial risk, associated with misalignment between cost recovery expectations and actual savings or cash flows, which may place pressure on organisational budgets and financing arrangements.
- Information asymmetry, referring to differing levels of insight between EPC clients and ESCOs regarding retrofit performance, potentially resulting in misaligned expectations and risk perceptions.

On the other hand, external risks may refer to:

- Market and economic conditions, relating to energy price volatility, interest rate shifts, and evolving technology markets that may affect EPC viability and investment returns.
- Policy and regulatory uncertainty, including changing policy directions, shifting incentives, or emerging regulatory frameworks that may influence contract terms and client confidence.

- Baseline and measurement challenges, referring to difficulties in establishing credible and representative baselines due to market fluctuations and variable facility conditions.
- Stakeholder relationship risks, arising from differing objectives and risk tolerances among governments, financiers, asset owners, and ESCOs, potentially affecting contract design and implementation success.

5.4. Synthesis of critical conditions affecting EPC implementation

Table 6 provides a concise overview of the main factors shaping EPC implementation, highlighting key enabling conditions, common barriers and risks, and indicative mitigation measures relevant to both policy design and project delivery.

Table 6. Summary of critical conditions influencing EPC success in practice

Dimension	Key drivers/enabling factors	Common barriers/risks	Mitigation measures
Strategic & organisational	• Strong political and/or senior management commitment • Clear alignment with organisational energy, climate, and/or asset strategies • Dedicated project leadership and effective internal coordination	• Limited internal capacity or EPC experience • Fragmented responsibilities across departments • Weak ownership of long-term contracts • Project delays, weak supervision, or loss of performance benefits	• Establishment of dedicated cross-departmental EPC teams • Clear allocation of roles and responsibilities • Long-term institutional commitment and internal governance procedures • Capacity-building measures
Technical & data-related	• Reliable baseline data and energy audits. • Mature technologies. • Robust M&V frameworks and protocols.	• Poor data availability or quality • Baseline uncertainty • Overly complex or bespoke technical solutions • Underperformance, verification disputes, or increased corrective costs	• Standardised M&V methodologies (e.g. IPMVP) • Independent technical verification and audits • Conservative baseline assumptions and phased validation • Use of proven and scalable technologies
Financial & economic	• Rising energy costs improving EPC attractiveness • Access to third-party finance, guarantees, or technical assistance • Aggregation strategies	• Budgetary constraints and long payback expectations • Limited lender familiarity with EPC models • Financing gaps, cash-flow stress, or reduced market interest	• Aggregation and portfolio-based approaches • Public guarantees and blended finance mechanisms • Life-cycle cost analysis and realistic savings projections • Financial risk-sharing arrangements
Contractual & procurement-related	• Clear risk allocation and contractual transparency • Standardised EPC templates and documentation • Transparent and value-based procurement approaches (e.g. BPQR)	• Complex procurement rules and lengthy procedures • Legal disputes, low competition, or high transaction costs	• Standardised EPC contracts and procurement toolkits • Structured market engagement procedures • Clear M&V and performance clauses

Market & stakeholder-related	• Mature ESCO market and financing ecosystem • Availability of facilitators and/or aggregators • Trust built through prior EPC projects and collaboration.	• Immature ESCO markets • Information asymmetry between stakeholders • Limited market appetite • Weak bids, overpricing of risk, or project failure	• EPC facilitation and technical assistance services • Market consultations and awareness-raising activities • Capacity-building for LRAs and ESCOs • Project aggregation and replication initiatives.
External & contectual	• Supportive regulatory and policy frameworks • Stable accounting and statistical treatment of EPC investments	• Regulatory uncertainty • Changes in energy prices or policy priorities • Reduced investability, contract renegotiation, or early termination.	• Stable and transparent policy frameworks • Long-term regulatory guidance and standard interpretation • Flexible contractual adjustment mechanisms • Continuous monitoring of policy and market developments.

Focus Box 5: EPC Success Factors - Public vs Private Clients

While the core EPC principles remain consistent, success factors, constraints, and risks differ significantly between public and private EPC clients.

- Public-sector EPC clients, including LPAs, often use EPC to support policy objectives, modernise public assets, and address budget constraints. Success depends on strong political commitment, internal coordination, and access to facilitation or aggregation support. Common challenges include complex procurement procedures, limited in-house expertise, and long-term contractual and accounting considerations.
- Private-sector EPC clients are primarily driven by cost reduction, asset performance, and return on investment. Greater procurement flexibility can accelerate implementation, although barriers may arise from short investment horizons, preference for direct CAPEX, or limited familiarity with performance-based contracting. Key risks often relate to baseline assumptions, operational changes, and savings performance.

EPC approaches require, as a result, tailored application rather than a uniform model.

6. Summary of key takeaways

What is EPC about? EPC is a performance-based contractual arrangement in which an ESCO designs, implements, and often finances EE and related measures while guaranteeing measurable performance outcomes, typically linked to verified energy or cost savings. Through this structure, EPC combines technical expertise, long-term performance guarantees, financing, and risk allocation into a single delivery framework that enables public authorities to modernise assets and improve operational performance without requiring major upfront investment.

How is EPC structured in practice? At its core, EPC is a long-term contractual arrangement between an EPC client and an ESCO, under which the ESCO designs, implements, and often finances EE and/or RES measures while guaranteeing measurable energy performance outcomes. In practice, EPC typically includes:

- Turnkey delivery arrangements, where the ESCO assumes integrated responsibility for project design, implementation, financing support, commissioning, and performance monitoring.
- Performance-based contractual structures, where payments are linked to verified energy or cost savings and the ESCO assumes technical and performance risk through contractual guarantees.
- Financing and risk-sharing configurations, which may involve owner financing, ESCO financing, or third-party financing arrangements, often supported by public incentives or aggregation mechanisms.

Across all arrangements, EPC operates through a long-term performance-based cash-flow logic in which investments are gradually recovered through verified savings over the contract period.

What are the main EPC models and how they are applied across sectors? EPC can be implemented through different contractual and financing models depending on how financing responsibilities, savings guarantees, and risk allocation are structured. The main EPC models typically include:

- Guaranteed savings models, where the EPC client secures financing directly, while the ESCO guarantees the agreed performance outcomes.
- Shared savings models, where the ESCO finances or arranges financing for the investment and is repaid through a share of the verified savings generated.

Beyond these two primary structures other variations recognised in the EU include the Chauffage (or Chaffee) and the First-Out (or First Repayment) models.

WHO SHOULD USE EPC? EPC is particularly relevant for LRAs seeking to accelerate the energy transition by reducing energy consumption, lowering CO_2 emissions, modernising public assets, and securing predictable long-term operational savings. EPC may also be suitable for:

- Local and regional energy agencies acting as EPC facilitators or aggregators supporting project preparation and market engagement.
- Owners and managers of commercial or tertiary-sector building portfolios seeking long-term asset optimisation and compliance with evolving building standards.
- Housing associations and residential aggregators implementing large-scale retrofit programmes.
- Energy-intensive industrial facilities aiming to improve operational efficiency without diverting capital from core business activities.
- Local energy communities developing community-based RES and energy management projects.

WHEN IS IT MOST EFFECTIVE? EPC is generally most effective when:

- Assets demonstrate clear and measurable energy-saving potential.
- Reliable baseline data and energy audits are available.
- Projects require medium- to long-term investment horizons.
- EPC clients seek to transfer technical and performance risks to qualified ESCOs.
- Projects need to be implemented without significant upfront capital expenditure.
- Supportive procurement frameworks, standardised templates, facilitation services, and competitive ESCO markets are available.

Public buildings – in particular the wider MUSH market - and street lighting currently represent the most mature, widespread, and largest share of EPC applications across all EPC models in Europe.

References

BOOSTEE-CE. (2019). *Transnational methodological framework for a roadmap development*. OnePlace; Fondazione Bruno Kessler. (Link)

Buildings Performance Institute Europe (BPIE). (2025a). *Delivering the EPBD: A guide towards better, affordable and more resilient buildings for all in Europe.* (Link)

Buildings Performance Institute Europe (BPIE). (2025b). *From cost savings to societal gains: Rethinking the cost-optimal methodology*. (Link)

De Tommasi L., Papadelis S., Agrawal R., & Lyons P. (2024). Analysis of business models for delivering energy efficiency through smart energy services to the European commercial rented sector. *Open Research Europe*, *2:131*. (DOI)

Eurac Research. (2018). *Energy Performance Contracting: an alternative financing scheme. Interreg Central Europe.* Interreg Central Europe. (Link)

European Commission. (2015). *Guidance for practitioners on the avoidance of the most common errors in projects funded by the European Structural and Investment Funds*. (Link)

European Commission. (2023). *Energy Efficiency Directive*. (Link)

European Commission. (2025). *New impetus for energy efficiency*. (Link)

European Investment Bank (EIB). (2011). *Procurement of PPP and the use of Competitive Dialogue in Europe*. (Link)

European Investment Bank (EIB). (2018). *Guidance on Energy Efficiency in Public Buildings.* (Link)

European Investment Bank (EIB). (2021). *EPEC Guide to Public-Private Partnerships*. (Link)

European Union. (2023). *Directive (EU) 2023/1791 on energy efficiency (recast)*. (Link)

Eurostat & European Investment Bank. (2018). *A Guide to the Statistical Treatment of Energy Performance Contracts*. (Link)

Fokaides, P., & Klumbyte, E. (2024). *Enhancing building energy performance with digital twin technologies: Insights from the SmartWins project.* BUILD UP. (Link)

ICLEI. (2018). *Life Cycle Costing Tool Development*. (Link)

Institute for Building Efficiency. (2010). *Energy Performance Contracting in the European Union*. (Link)

International Energy Agency (IEA). (2025). *Energy Efficiency Policy Toolkit 2025*. (Link)

Li, L. (2022). Analysis on influencing factor of cost control of EPC project based on the DEMATEL-ISM. *Civil Engineering Journal*, *31*(1). (DOI)

Maduta, C., Tsemekidi-TZeinaraki, S., Castelazzi, L., Dagostino, D., Melica, G., Paci, D., & Bertoldi, P. (2025). *Updates on the Energy Performance of Buildings Directive implementation in the EU Member States*. (DOI)

Moles-Grueso, S., Bertoldi, P., & Boza-Kiss, B. (2023). *Energy Performance Contracting in the EU – 2020-2021*. (DOI)

SECCA. (2025). *Energy performance contracting: EPC contract types. SECCA Knowledge Hub*. (Link)

Todeschi, V., Bertoldi, P., Hernandez Moral, G., Clementi, E., & Treville, A. et al. (2025). *Financial instruments for mitigation, adaptation and energy poverty actions - Covenant of Mayors Guidebook Complementary document 5*. (DOI)

Wan, S., Liu, Y., Ding, G., Runeson, G., & Er, M. (2023). Risk allocation for energy performance contract from the perspective of incomplete contract: a study of commercial buildings in China. *International Journal of Climate Change Strategies and Management*, *15*, 457–478. (DOI)

World Bank. (2023). *Rated Criteria Playbook A Practitioners Guide for the Use of Rated Criteria in Procurement*. (Link)

World Bank. (2025). *Rated Criteria Library*. (Link)

Yang, E., Chen, C., Li, K., Guo, K., Hua, Y., & Zhang, L. (2025). Challenges and strategies for energy performance contracting: A critical review. *Journal of Building Design and Environment*, *3*. (DOI)

Yang, Y., Huang, Z., Chen, Y., Luo, L., & Li, F. (2025). Strategies for optimizing EPC project cost management via analytic hierarchy process: a case study approach. *Journal of Asian Architecture and Building Engineering*. (Link)

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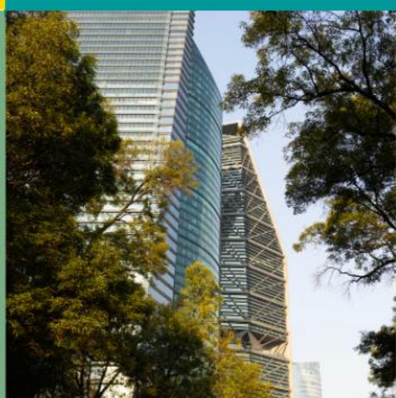
Website: https://h2020prospect.eu/



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