# Energy Efficiency First: 2023 status

## EU policy update and pilot country analysis

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# Legal Notice



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# EXECUTIVE SUMMARY

The Energy Efficiency First (EE1st) principle suggests that energy efficiency improvements and other demand-side resources need to be selected whenever they are more cost-effective than equivalent power plants, transmission networks, storage systems, and other supply-side infrastructures.

The Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action established EE1st primarily as an overarching principle for the National Energy and Climate Plans (NECPs). This ground was complemented in September 2021 by the Commission Recommendation (EU) 2021/1749 with general guidelines to implement EE1st in main sectors.

Building on the previous Horizon 2020 Enefirst project, the aim of the follow up LIFE Enefirst Plus project is to provide key stakeholders in all Member States with technical support to implement EE1st. The general approach is to complement existing resources to plug EE1st in major decision making processes. This will be tested with pilot cases in four countries (Croatia, Italy, Greece and Poland).

The aim of this report is twofold: (1) to provide an overview of recent EU policy developments relevant to EE1st; and (2) to analyse the background in the four pilot countries and introduce the context and objectives of the first pilot cases.

Overall, the new provisions from the various pieces of the 'Fit-for-55' package strengthen the basis and requirements to implement EE1st. They also highlight key areas where EE1st should be systematically considered. Article 3 of the new Energy Efficiency Directive (EED) is dedicated to EE1st, bringing a stronger legal basis for its implementation and monitoring.

The existing provisions of the Electricity Directive (EU) 2019/944 and Regulation (EU) 2019/943 relevant to EE1st in the power sector are reinforced by Article 27 of the new EED that highlights the key role of National Regulatory Authorities. The 2023 EU Grid Action Plan highlights the importance of anticipating future needs in network infrastructure, considering alternatives.

The existing national comprehensive assessments on heating and cooling will be complemented with local heating and cooling plans that could be a major opportunity to implement EE1st by considering jointly the possible actions on the demand and supply of heating and cooling.

Similarly, the National Building Renovation Plans and Building Renovation Passports should provide a stronger ground for the implementation of EE1st in decisions for building renovations, while the objective of phasing out fossil fuels for heating and cooling is set more clearly in the new Energy Performance of Buildings Directive.

The extended EU Emission Trading Schemes to cover the use of fossil fuels in buildings and road transports will provide a fairer ground when comparing the cost-effectiveness of demand-side and supply-side measures.

The first set of pilot cases of Enefirst Plus will explore some of these areas:

- Transmission network development plan and cost-benefit analysis for transmission grid projects (in Croatia);
- Heating and cooling plans (in Greece);
- Suistanable Energy and Climate Action Plans of municipalities (in Italy);
- Cooperation between DSOs and prosumers (in Poland).

The preliminary analysis of the background on EE1st in each country shows diverse situations. Moreover, as assessed by the European Commission, the way EE1st has been addressed in the draft updated NECPs often remains in general terms, without clarifying how EE1st would be implemented in practice. The Enefirst Plus' pilot cases therefore offer valuable opportunities to further investigate the potential for implementing EE1st, as well as for improving the related reporting.

# 1 Introduction

**Energy Efficiency First (EE1st)** became a buzzword in the European energy discussion since its introduction to the Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action adopted in December 2018. Even though since then it gets included in most of recast legislation (especially with the 'Fit-for-55' package[1]), the level of understanding, let alone of implementation, remains limited. **Implementation and related reporting are still weak**, as stressed in the EU wide assessment of the draft updated National Energy and Climate Plans – NECPs (European Commission 2023a)[2]:

> "*It is important that the final updated NECPs are more explicit in detailing how Member States will implement this principle*. (…) *several draft plans did not mention the principle in any form.*"

The assessment acknowledges progress in some draft updated NECPs due by 30 June 2023 compared to the previous NECPs due by 31 December 2019:

> "*The energy-efficiency-principle is reflected in several policy areas in Cyprus's draft updated NECP, while Greece, Spain, Lithuania, Luxembourg and Romania covered the principle at least in some policy areas in their draft updated NECPs.*"

This shows that implementing EE1st is easier said than done. The aim of the Horizon 2020 **Enefirst** project (September 2019 – July 2022) was to increase the level of understanding and provide the ground for implementation of EE1st in the buildings sector, by:

- Clarifying the concept of EE1st and its background (see Pató *et al.* 2020a; Mandel *et al.* 2022a);
- Analysing existing examples where EE1st is implemented (see Pató *et al.* 2020a);
- Developing and implementing a methodology for quantitative assessment of EE1st scenarios and case studies (Hummel *et al.* 2023; Mandel *et al.* 2022b; Mandel *et al.* 2022c; Mandel *et al.* 2022d; Mandel *et al.* 2023); and

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal/fit-55-delivering-proposals_en

[2] For more details and discussions about the integration of EE1st in the NECPs, see the proceedings of the first webinar of Enefirst Plus (29 February 2024): https://ieecp.org/2024/03/04/integrating-energy-efficiency-first-in-the-final-update-of-national-energy-and-climate-plans-enefirst-plus-webinar-materials/

- Analysing the EU policy framework and developing recommendations (Pató *et al.* 2021; Rieke Boll *et al.* 2021; Fabbri *et al.* 2022).

Building on the previous Horizon 2020 Enefirst project, the aim of the follow up LIFE Enefirst Plus project

Building on the previous Horizon 2020 Enefirst project, the aim of LIFE **Enefirst Plus** project (November 2023 – October 2026) is to provide key stakeholders in all Member States with the technical support needed to effectively implement EE1st across various sectors, particularly focusing on key decision-making processes.

The general approach is to complement existing resources to **plug EE1st in the decision making** for investments in energy infrastructure, energy planning, and designing incentives. Enefirst Plus will test this approach in four countries (Croatia, Italy, Greece and Poland) and scrutinise the implementation of EE1st in two pilot cases in each of those countries. The new resources and pilot cases produced by the project, as well as experiences from other countries, will serve as foundational elements for capacity building and experience sharing activities, and for the development of a community of practice.

The aim of this report is twofold:

- First, to provide an **overview of EU policy development** until early 2024 by assessing the integration of the principle in new/recast legislation (*cf.* 'Fit-for-55' package). **Chapter 2** presents the policy update on the principle since 2022, complementing the analysis done in the previous Enefirst project (see Pató *et al.* 2021 and Rieke Boll *et al.* 2021). It starts with reminding the definition of EE1st and then visits the key new or revised pieces of legislation relevant to its implementation.
- Second, **Chapters 3-6** contain a **background policy assessment in the four pilot countries** (Croatia, Greece, Italy, Poland), focusing on the policies or fields of implementation linked to their first pilot case. This background analysis starts for each country with a concise assessment of their draft updated NECP and relevant national legislation viewed through the lens of EE1st. This is complemented with an introduction of the context and objectives of the first pilot case in each country.

This document will serve as the background for upcoming project activities, especially for the development and testing of resources in the first set of pilot cases.

# 2 EU policy update

This section covers the relevant provisions of the new EED (Energy Efficiency Directive, (EU) 2023/1791) and the yet-to-be-published new EPBD (Energy Performance of Buildings Directive, as approved on 12 April 2024), and recaps those pieces of legislation that were already discussed in Enefirst[3] (Electricity Directive and Regulation, RED – Renewable Energy Directive and ETS – Emission Trading Scheme). The yet-to-be-adopted Gas Directive will be analysed in the next Enefirst Plus' report on policy background (scheduled in 2025).

This policy review is therefore focused on the **new provisions relevant to the implementation of EE1st**.

## 2.1 The definition of the principle and its cross-cutting implementation

### 2.1.1 Definition from the Governance Regulation

The EE1st principle suggests that energy efficiency improvements and other demand-side resources need to be selected whenever they are more cost-effective than equivalent power plants, transmission networks, storage systems, and other supply-side infrastructures. The principle therefore recognizes that there are multiple ways to achieve objectives, both on the demand and supply side of the energy system.

The Regulation (EU) 2018/1999) on the **Governance of the Energy Union and Climate Action** provides a **formal definition** of the EE1st principle. Article 2(18) states:

> *" 'energy efficiency first' means taking utmost account in energy planning, and in policy and investment decisions, of alternative cost-efficient energy efficiency measures to make energy demand and energy supply more efficient, in particular by means of cost-effective end-use energy savings, demand response initiatives and more efficient conversion, transmission and distribution of energy, whilst still achieving the objectives of those decisions."*

[3] See (Pató et al. 2021) and (Rieke Boll et al. 2021).

This definition is complemented with Recital (64) of the Governance Regulation:

> *"Member States should use the 'energy efficiency first' principle, which means to consider, before taking energy planning, policy and investment decisions, whether cost-efficient, technically, economically and environmentally sound alternative energy efficiency measures could replace in whole or in part the envisaged planning, policy and investment measures, whilst still achieving the objectives of the respective decisions."*

As pointed out in the research literature (Mandel *et al.* 2022), three particular aspects of the official definition of the EE1st principle warrant special attention:

- **Objectives** | The EE1st principle is about comparing options for technology adoption and behaviour change with respect to stated objectives. The fundamental objective for any consumer or producer in the energy system is to provide energy services, such as thermal comfort. For society at large and its policymakers in the EU, broader objectives include decarbonisation, energy security, market integration, among others;
- **Technological and behavioural solutions** | The EE1st principle acknowledges that a kilowatt-hour of energy saved is equivalent to a kilowatt-hour produced when it comes to meeting consumers' energy service needs and achieving societal objectives. On the supply side, this involves generation, efficient networks, and storage facilities. On the demand side, end-use energy efficiency, demand-side flexibility, and sustainable behaviour changes ('energy sufficiency') are critical options. The role of demand-side flexibility is particularly highlighted in the EED recast (Directive (EU) 2023/1791);
- **Cost-efficiency** | The EE1st principle seeks to identify and consider the combination of technological and behavioural measures that have the lowest cost or highest benefit to achieve the same level of energy services and societal objectives. As stated in article 3.3(a) of the new EED, this explicitly goes beyond financial costs and benefits, and also involves "wider benefits of energy efficiency solutions", such as health, energy security, economic growth, among others. This is in line with the first point on multiple objectives.

In summary, as stated in Recital (9) of the **Commission Recommendation (EU) 2021/1749** (European Commission, 2021), the EE1st principle involves a **holistic approach** that considers both demand- and supply-side solutions across the energy conversion chain with a view to climate neutrality and other objectives. As emphasized in Recital (11) of the same Commission Recommendation, this implies that efficiency solutions might not always be the preferred option in planning, policy and investment decisions. The main objective of the EE1st principle is not to reduce energy consumption, but *"to consider actions in energy efficiency and energy demand management on an equal footing with […] energy supply or energy*

*infrastructure investments"* (Recital 11), so that intended objectives are met using the least-cost alternatives available.

### 2.1.2 The legal basis provided by the new Article 3 of the Energy Efficiency Directive

As set out in Recital (15) of the EED ((EU)2023/1791), the overall objective of Article 3 is to establish the EE1st principle as an *"overarching principle that should be taken into account across all sectors, going beyond the energy system, at all levels, including in the financial sector. Energy efficiency solutions should be considered as the first option in policy, planning and investment decisions, when setting new rules for the supply side and other policy areas."*

In particular, Article 3 of the EED requires Member States to comply with the following obligations:

- Art. 3 (1): Ensure that demand-side resources are assessed in **planning, policy and major investment decisions**, related to (a) energy systems, and (b) non-energy sectors;
- Art. 3 (4): Ensure that the application of the EE1st principle is **monitored** by relevant authorities, where decisions are subject to approval and monitoring requirements;
- Art. 3 (5): (a) Promote the application of **cost-benefit methodologies** that allow proper assessment of the **wider benefits** of energy efficiency solutions; (b) Address energy poverty issues; (c) Identify a monitoring entity on the application of the EE1st principle; (d) Report on the application of the EE1st principle in the integrated national energy and climate progress reports.

This new article thus clarifies that EE1st shall become a guiding principle for any decision with a significant impact on energy systems. The monitoring requirements implicitly show that current practices do not consistently adhere to the EE1st principle.

To assist Member States in applying the EE1st principle across various decision-making processes, in 2021 the European Commission issued the Recommendation (EU) 2021/1749 on Energy Efficiency First, that builds on the requirements of the EED and calls for specific actions in relation to the application of the principle. The Recommendation (EU) 2021/1749 also contains dedicated guidelines for the operation and application of the principle, by proposing specific tools and examples of application in various sectors.

Moreover, the upcoming guidance note by the European Commission on Article 3 of the EED will provide an overview of its main provisions, including the new

requirements for Member States and the steps they must take to achieve the article's objectives.

## 2.2 EE1st and the power sector

### 2.2.1 Relevant provisions of the Electricity Directive and Regulation

The Electricity Directive (EU) 2019/944 and Regulation (EU) 2019/943 provide a rather comprehensive framework for implementing the EE1st principle in the power sector. Given the unique nature of the power system requiring constant balance between supply and demand, the focus is placed more on demand-side flexibility rather than on end-use efficiency. In the assessment below we move from provisions related to the competitive segment (markets and energy tariffs) towards those pertaining to regulated entities, *i.e.* network companies.

**Access to power market**. As demand-side resources are often cheaper than generation options, especially in tight supply conditions (peak periods), their access to markets can reduce the cost of power services – not only to those consumers involved in their provision, but to all consumers, via lower wholesale prices and a reduced need for generation capacities (Fiorini *et al.* 2022). However, this requires market rules that enable them to access the various power markets (wholesale, balancing) as well as the capacity mechanisms, where applicable. The European legislation made a significant step to the integration of demand-side resources in 2019. The Electricity Directive (EU) 2019/944 requires Member States to allow and foster participation of demand response (through aggregation) and defines the right of all consumers to enter all markets in a non-discriminatory manner. The Electricity Regulation (EU) 2019/943 calls for market rules to facilitate the development of more flexible demand (next to flexible and low carbon generation), including balancing, day-ahead and intraday markets, as well as capacity mechanisms. The dispatching of power-generating facilities and demand response must be non-discriminatory and transparent. The transposition of this legislative framework is slow and uneven across the Member States[4].

**Dynamic tariffs**. The pattern of consumption has a direct effect on energy infrastructure requirements, including both networks and generation capacities. The total electricity tariff (consisting of the energy component, the network charges, taxes

[4] https://www.euractiv.com/section/electricity/news/eu-eyes-billions-worth-in-flexibility-from-local-electricity-grids/

and levies) has to incentivise final consumers to make choices that are consistent with the optimal choices from a power system perspective. Time-differentiated volumetric network and retail tariffs incentivise the smart use of existing networks and hence can reduce the need for grid capacity extensions. The Electricity Directive defined various consumer entitlements that enable the deployment of time-differentiated retail tariffs. All suppliers with more than 200,000 customers must provide at least one such tariff for consumers equipped with smart meters (Art. 11). All customers are free to purchase and sell electricity services, including aggregation, other than supply, independently from their electricity supply (Art. 13). Every customer is entitled to have – but also bears the cost of – a smart meter installed under fair, reasonable and cost-effective conditions (Art. 21). Network tariff design is directed in the Electricity Regulation which allows for distribution tariffs to contain a fixed element (Art. 18). The reference in Article 18 to a fixed tariff element is contradictory to the general requirement of the Regulation that network tariffs are designed in a way to avoid creating disincentives for demand response.

**Network planning**. Network companies traditionally size network capacity to peak load that will potentially increase with the electrification of heat and transport. Network companies have to consider demand-side resources in grid planning and operation, in order to reduce the network investment necessary for reliable service. The Electricity Directive requests that the national regulator provides the necessary regulatory framework to allow and provide incentives to Distribution System Operators (DSOs) and Transmission System Operators (TSOs) to procure flexibility services and promote the uptake of energy efficiency measures, where such services cost-effectively alleviate the need to upgrade or replace electricity capacity. DSOs are required to procure these resources in a non-discriminatory and competitive way and provide transparency on the medium- and long-term flexibility services needed, as well as on planned investments for the next 5-10 years in their distribution network development plans.

**Network company incentives**. National regulation needs to define financial incentives for regulated network companies that avoid their bias towards building more grids and consider and invest into demand resources in a technology-neutral way. Creating a similar revenue earning on all types of expenditures is just the first step. Additionally, introducing financial reward/penalty schemes based on the performance of the network company, so called performance-based regulation or output-based regulation, can further enhance the contribution of these companies to the policy goals and align with consumer needs. The Electricity Regulation (Art.18) states that national regulatory authorities "*may introduce performance targets in order to incentivise distribution system operators to raise efficiencies, including through energy efficiency, flexibility and the development of smart grids and intelligent metering systems, in their networks*."

Article 27 of the new EED complements the provisions of the Electricity Directive and Regulation, highlighting the **role of National Regulatory Authorities** (see below section 2.2.3).

The upcoming recast of the electricity market design is not primarily focused on these issues but might include some relevant provisions. It will be analysed in the second half of the Enefirst Plus project.

*For a more detailed analysis of the previous background for implementing EE1st in the power sector, see section 3.2 in (Pató et al. 2021) and related guidelines in section 1.2 in (Rieke Boll et al. 2021)*.

### 2.2.2 Relevant provisions of the EU Grid Action Plan

The European Commission (2023b) published its Grid Action Plan at the end of 2023 as a response to the slow implementation of the network related provisions in the Electricity Directive and Regulation and the mounting evidence on current **grid scarcity** experienced in several Member States, most pressingly in the Netherlands (Pató 2024). Scarcity is manifested in application queues and long estimated connection times. The Action Plan does not prescribe new provisions, but makes them more explicit and concrete, and provides triggers via the listed actions at EU level for better and faster national implementation. Most relevant actions for the implementation of the EE1st principle are:

- European overview of grid hosting capacities by mid-2025;
- Recommendation for enhanced distribution network planning by the EU DSO Entity by mid-2024;
- Commission guidance on the conditions for anticipatory investment by mid-2025;
- Next ACER (Agency for the Cooperation of Energy Regulators) report of network tariff focusing on the promotion of innovative grid solutions.

### 2.2.3 Article 27 EED on energy transformation, transmission and distribution

This Article is an update of Article 15 in the previous EED (2012/27/EU). It starts with a general call on Member States to make sure that gas and electricity transmission

and distribution system operators apply the EE1st principle across their activity portfolio, including network planning, network development and investment decisions.

Then it moves on to define various requirements/tasks for the national regulators that are highly relevant for the implementation of the principle, such as:

- Apply the EE1st principle, among other principles, regarding their decisions on the operation of the gas and electricity infrastructure, including their decisions on **network tariffs**;
- Ensure the **removal of counter incentives** in transmission and distribution tariffs to the energy efficiency of the generation, transmission, distribution and supply of electricity and gas;
- Verify that methodologies used by TSOs and DSOs to **assess alternatives in the cost-benefit analysis** take into account the **wider benefits** of energy efficiency solutions, demand-side flexibility and investment into assets that contribute to climate change mitigation;
- **Verify the implementation** of the EE1st principle by the TSOs and DSOs when approving, verifying or monitoring their projects and network development plans;
- Provide **methodologies and guidance** on how to assess alternatives in the cost-benefit analysis;
- **Report** on the progress achieved, measure carried out and recommendation with regards to energy efficiency improvements of gas and electricity infrastructure, including cost-efficient alternatives that reduce peak loads and overall electricity use; and
- Encourage transmission and distribution system operators to develop innovative solutions to improve the energy efficiency of existing and future systems through **incentive-based regulations** as suggested by the Electricity Regulation.

Article 27 reiterates provisions in the Electricity Directive and Regulation, making them more concrete and extends their application **to the gas infrastructure as well**.

## 2.3 EE1st and the heating & cooling sectors

### 2.3.1 Heating and cooling plans in Articles 25 and 26 EED

The revised EED (EU) 2023/1791 reinforces provisions on the national **comprehensive assessment of heating and cooling** (*cf.* Article 25, replacing previous Article 14 from the EED 2012/27/EU), and the requirements for the **efficiency of district heating** and the **use of waste heat** (*cf.* Article 26). Regional and local heating plans are newly required, as from Article 25 (6) EED (EU) 2023/1791, complementing the framework for heating and cooling.

The comprehensive assessment and update about related policies and measures are now part of the process of the National Energy and Climate Plan (NECP) and its update[5] (see Article 25 (1) EED (EU) 2023/1791). Assessment and planning for heating and cooling are indeed a major component of the overall energy planning. The linkage with the NECP process ensures that the timelines between the components of the energy planning are aligned.

Articles 25 and 26 set requirements that are consistent with the general approach for EE1st set in Article 3: they cover **planning, related policies and cost-benefit analysis** for major infrastructures and investment decisions. They are however mostly focused on heating and cooling supply, as discussed below.

The comprehensive assessments should now be jointly done with the assessment of renewable potential, and use of waste heat and cold in the heating and cooling sector (required by the Renewable Energy Directive 2018/2001, Article 15). Article 25 (4) EED specifies cases where the use of waste heat should be considered on a systematic basis (including for on-site use of waste heat). Additionally, Part III of Annex X does explicitly require the analysis of economic potential for efficiency in heating and cooling to consider renewable energy sources (RES) options in addition

[5] Comprehensive assessments were previously due every five years, from 2015. With the new EED published in September 2023, comprehensive assessments are now due together with the NECP (or updated NECP), still every five years. The Commission's guidance for updated NECPs 2021-2030 clarified that the next update of the comprehensive assessments was due by 30 June 2024, together with the final updated NECPs: https://energy.ec.europa.eu/publications/guidance-ms-updated-necps-2021-2030_en

to the use of waste heat and high efficiency cogeneration[6]. These provisions favour **better coordination between RES and heating and cooling** policies and planning, *i.e.* an integrated approach to decarbonize heating and cooling supply.

The provisions of Article 26 on energy efficiency in the supply of heating and cooling complement this by specifying **criteria for efficient district heating and cooling systems**. These provisions combine increasing requirements on decarbonising heating and cooling supply, with requirements for existing district heating and cooling to increase their efficiency (in primary energy) and reduce network losses, in 5-year plans. This may encourage district heating operators to consider the possibility of using low temperature options, and thereby whether the connected buildings are efficient enough to do so.

The approach to promote efficiency and RES in heating and cooling supply follows a **logic in line with the EE1st principle**: first comparing the options (*cf.* comprehensive assessments), then taking "adequate measures" to ensure that the cost-effective potentials are used (Article 25(4) and (5) EED (EU) 2023/1791).

Article 25 does not explicitly promote an integrated planning of supply and demand for heating and cooling at the national level: it **focuses on alternative supply options** with a focus on shifting to renewables, reducing process losses by using waste heat and reducing network losses. The link with the demand-side is only made in Annex X (Part I (6) EED (EU) 2023/1791), that requires heating and cooling assessments to include a forecast of heating demand trends, considering "*the change in demand in buildings and different sectors of the industry, and the impact of policies and strategies related to the demand management, such as long-term renovation strategies*" (required by the Energy Performance of Buildings Directive (EU) 2018/844)[7]. While this requires **anticipating the evolutions in the demand**, it does not require to consider different levels of ambition in efficiency in the demand-side (to reduce the heating and cooling demand), as a complement or alternative to the potentials assessed on the supply-side.

Moreover, the requirements of Annex X (part III) about the analysis of the economic potential for efficiency in heating and cooling are focused on the assessment of supply options only. This does not seem fully consistent with Article 25(3) that now makes an explicit link with the EE1st principle:

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[6] This provision in current Annex X was already added by the 2019 amendment of previous Annex VIII. See Commission Delegated Regulation (EU) 2019/826.

[7] The need to ensure consistency between comprehensive assessments and long-term renovation strategies is also highlighted in recital 101 of the EED recast.

> "*The cost-benefit analysis shall be capable of facilitating the identification of the most resource- and cost-efficient solutions to meeting heating and cooling needs,* ***taking into account the energy efficiency first principle***".

This should imply to include the demand-side options in the scope of analysis, *i.e.* considering **scenarios with different ambitions on end-use efficiency** (which could be taken from the long-term renovation strategies[8]). The level of demand is nevertheless part of the factors to be considered in the sensitivity analysis.

Part III of Annex X also specifies that the analysis of economic potential shall **consider socioeconomic and environmental factors**, which is in line with the approach of EE1st to include multiple impacts in the scope of analysis[9].

The EED recast complements the previous framework (national assessment and mapping, and cost-benefit analysis at site level), with the requirement for Member States to "*ensure that regional and local authorities prepare* ***local heating and cooling plans***", at least in municipalities of more than 45,000 inhabitants (Article 25(6) EED). These plans should, among others, "***be compliant with the energy efficiency first principle***" (point (b) of Article 25(6) EED) and "*provide an estimate and mapping of the potential for increasing energy efficiency"* in the heating and cooling supply (point (a) of Article 25(6) EED).

The regional and local plans should be based on the national comprehensive assessment, acknowledging the essential role of regional and local levels in getting the comprehensive assessments from potentials to implementation[10]. Hence also the requirement to "*involve all relevant regional and local stakeholders*" (point (d) of Article 25(6) EED). This **participatory approach** may support the implementation of the EE1st principle, by creating the conditions that encourage the consideration of the most relevant options.

Such conditions could be met if stakeholders representing the demand-side (*e.g.*, local energy-intensive industries, associations of owners, social housing bodies) take part in the process. Point (d) of Article 25(6) highlights the need to involve operators of local energy infrastructure, but not explicitly the need to involve demand-side stakeholders. However, point (h) requires "*an analysis of heating and cooling appliances and systems in local building stocks, taking into account the area-specific potentials for energy efficiency measures and addressing the worst performing buildings and the needs of vulnerable households*". While this provision is still about

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[8] Now renamed 'national building renovation plan' in the EPBD recast (see section 2.4).
[9] This provision was already included in the 2019 amendment to previous Annex VIII, and specifies further the multiple impacts to be considered "*to the extent possible*": environmental, health and safety impacts, labour market, energy security and competitiveness.
[10] See Recital 104 of the EED recast.

the heating and cooling systems, and does not mention the building envelope, it does refer to the building stock.

### 2.3.2 District heating and cooling

For district heating and cooling (DHC) systems, the **efficiency criteria** are set out in Article 26 EED (see above). In parallel, the energy efficiency of these systems is also regulated by Article 24 of the Renewable Energy Directive (EU) 2018/2001, commonly referred to as RED II.

RED II was significantly amended in November 2023 (*cf.* amending Directive (EU) 2023/2413), primarily to align with the EU's increased climate targets as part of the 'Fit-for-55' package. In particular, the amendment increases the indicative target for the integration of renewable energy sources (RES) from **waste heat and cold** in DHC systems. The target has been increased from an annual increase of 1 percentage point to 2.1 percentage points. To achieve this increased target, Member States are given several options, one of which is to grant to RES producers a **third party access (TPA)** to DHC systems. It is meant to facilitate the integration of sustainable, low-cost energy efficiency solutions, in particular waste heat and cooling, thereby improving the overall efficiency of DHC systems.

These amendments affect large DHC systems with a capacity above 25 $MW_{th}$, excluding smaller systems from the scope. In addition, there has been a change in the language used: system operators are now only 'encouraged' to consider TPA, as opposed to the previous mandate where they were 'obliged' to do so. Although these changes take into account the realities of TPA implementation, they may make it **more difficult to apply for TPA**, which could have an impact on the effectiveness of the integration of RES into DHC systems under the revised RED II framework.

*For a more detailed analysis of the previous background for implementing EE1st in district heating and cooling (especially about the interplay of building renovation with DHC planning), see section 3.4 in (Pató et al. 2021) and related guidelines in section 1.2 in (Rieke Boll et al. 2021)*.

## 2.4 EE1st and buildings

The key legislative framework for decarbonising buildings in Europe is the Energy Performance of Buildings Directive (EPBD) that – together with the EED – has been

revised to align with the increased EU ambitions (*cf.* 'Fit-for-55' package). The European Council adopted the final text of the new EPBD on 12 April 2024[11].

The **EPBD** is primarily a **demand-side directive** concerned with setting standards for and improving energy performance of buildings.[12] The Directive sets out measures to improve the performance of the building stock through both efficiency and building level renewable energy measures. The energy performance and buildings decarbonisation measures within the Directive will have implications for the planning of related infrastructure (electricity and gas grids, and district heating and cooling) but this is not explicitly governed by the Directive.

The new EPBD (Recital 38) states that **EE1st** is **one of the key principles for building renovation** to 2030 and 2050. The text further highlights that improved health and wellbeing and reduction of energy poverty are **co-benefits** of this approach when applied to the energy performance of buildings.

Article 3 of the new EPBD introduces a strengthened approach to renovation planning at Member States level through **National Building Renovation Plans**, which replace Long Term Renovation Strategies. These Plans, which are integrated in the NECPs as part of overall planning and governance, should be established "*in line with the energy efficiency first principle*" (as mentioned in Recital 37). The new EPBD text contains more prescriptive requirements on Member States in developing these Plans, via a template of mandatory and optional indicators (Annex II).

The new requirements place a greater focus on measures to alleviate energy poverty, worst performing buildings, financing and skills for renovation. They also require Member States to report on national plans to deliver on new provisions in the Directive including:

- Tighter standards for new buildings (**Zero Emissions Buildings**, in Article 7);
- **Minimum Energy Performance Standards for non-residential buildings** (requiring the worst buildings to be improved to above energy performance thresholds, defined in primary or final energy use in kWh/m²/year, benchmarked in the existing stock, in Article 9);
- **Residential stock improvement trajectories** (based on reduction of average primary energy use in kWh/m²/year at key milestones dates, in Article 9);

[11] https://www.consilium.europa.eu/en/press/press-releases/2024/04/12/towards-zero-emission-buildings-by-2050-council-adopts-rules-to-improve-energy-performance/
*N.B.* as the numbering of articles, paragraphs and annexes may still change until the final adoption by the Council, we do not include here the reference to articles and annexes.
[12] It should be noted that the targets in the EPBD are defined in primary energy use: they can therefore be achieved through efficiency in converting and carrying energy as well as in its end use.

- Policies and measures to **decarbonise heating and cooling** and the phase out of fossil fuels in heating and cooling with a view to a complete phase-out of fossil fuel boilers by 2040;
- Deployment of **solar energy** in buildings (in line with requirements in new provision on solar energy in buildings, in Article 10).

Article 2(20) also provides a **new definition of 'deep renovation'**, referring to renovations aligned with the EE1st principle and transforming a building into a nearly zero-energy building (when performed before 1 January 2030) or a zero-emission building (when performed as of 1 January 2030).

The new requirements in Article 12 for Member States to set up a scheme of voluntary **Building Renovation Passports** (BRPs) require that, when offered, BRPs should provide an explanation of the renovation measures included at each renovation step, the estimated energy savings, reduction of operational GHG emissions and bill savings. This approach assesses the suitability of individual energy efficiency or renewable energy renovation measures at building level and provides evidence of this assessment to the building owner, in line with the EE1st approach. The BRP should thus make it possible for owners to compare the most relevant options for renovating their building, considering actions on both sides, the building envelope (framing the energy demand) and the technical systems (to meet the energy demand).

The Directive requires Member States to come up with measures for the **phase-out of fossil fuels** in heating and cooling (with a view to a complete phase-out of boilers powered by fossil fuels by 2040). This will have massive implications for gas, power and heat networks. However a regulatory gap exists since the Directive does not connect the phase-out with grid planning.

As stressed in section 2.2.1, maximising the use of **demand-side flexibility** available to power consumers reduces the need for power networks and generation capacities, especially reserves. Demand-side flexibility is crucial for reducing the curtailment of variable renewables such as wind and solar and hence reducing the welfare loss of consumers connected to the grid. The EPBD includes some important provisions to promote demand-side flexibility, in particular essential conditions for the use of flexibility of electric vehicles: charging infrastructure adjacent to buildings. Major provisions in the new EBPD (Article 14) about flexibility from electric vehicles include:

- Buildings must have recharging points and Member States have to remove barriers to the installation of recharging points;
- Precabling for future charging points becomes a norm for new and refurbished buildings;
- These charging points must be smart, *i.e.* allowing for dynamic tariffs and automated dynamic charging;

- Where appropriate, charging infrastructure should enable bidirectional charging that would further enhance the use of flexibility.

In addition to the provisions on charging for electric vehicles, Articles 13 and 15 include measures to expand the use of energy storage and Building Automation and Control Systems (BACS), as well as a smart readiness indicator for large buildings. For all buildings, there is a new requirement for Energy Performance Certificates to have a yes/no indicator on whether the building has a capacity to react to external signals and adjust the energy consumption and an option for Building Renovation Passports to include an assessment of how the renovation steps could improve the smart readiness of a building. This should favour the development of demand-side flexibility from buildings.

## 2.5 EE1st and emissions pricing

The EE1st principle recognises the multiple impacts of energy efficiency and other demand-side solutions. These impacts include social, environmental and economic effects, emphasising the importance of considering a wide range of outcomes in energy-related decisions. An integral part of these impacts are **negative externalities**, *i.e.* impacts that are caused by one party, but have negative consequences for others. These externalities include not only greenhouse gas (GHG) emissions and their associated climate damage costs, but also other forms of pollution such as local air pollutant emissions that affect human health, biodiversity and crop yields, as well as noise and water pollution.

The EE1st principle calls for the integration of these socio-environmental impacts into planning decisions, impact assessments and cost-benefit analyses (for more details, see Mandel *et al.* 2022c). However, ultimately, economic incentives are needed to ensure that these impacts are taken into account by economic actors. A traditional approach to dealing with negative externalities is to **internalise** them, *i.e.* to reflect these costs in the market price of goods or services.

In the context of EE1st and the promotion of energy efficiency solutions, **pricing negative externalities** has two main effects. First, it encourages final energy savings by switching to less polluting and more efficient production processes, such as replacing gas boilers with heat pumps. Second, by raising the price of energy, it encourages useful energy savings through measures such as improving building insulation. The cost-effectiveness of such energy-saving measures is inherently linked to the avoided cost of energy, so – all else equal – a higher carbon price directly increases the attractiveness of energy-saving investments.

In economic terms, the pricing of externalities is crucial to the effective application of the EE1st principle. It levels the playing field between polluting energy production

processes and energy efficiency solutions by taking into account their wider societal impacts. The European Union uses two main instruments to price emissions: the **Emissions Trading System (ETS)** and emissions taxes. The EU ETS, which has been operational since 2005 for large industrial, heat and power generation installations, sets a cap on emissions with market-determined prices. The 2023 revision of the EU ETS Directive (EU) 2023/959 will introduce a separate system starting from 2027 and extend its scope to include road transport and fuel use in buildings (ETS II)[13], which is expected to provide a more effective **carbon price signal** for the transition to low-carbon and energy-efficient technologies.

However, the EU ETS is limited to greenhouse gases, which are only a subset of negative externalities. To fully embrace the EE1st principle, a **broader range of externalities** should be adequately priced, in particular local air pollutants emissions such as nitrogen oxides, sulphur dioxide and particulate matter. These pollutants pose significant health and environmental risks. Currently, there is no unified pricing mechanism for non-greenhouse gas air pollutants at EU level, with regulation primarily delegated to national governments.

Another relevant issue is the **distortion of energy taxes and charges** within the EU. The current tax structure disproportionately burdens electricity more than fossil fuels. For example, concerning energy use in buildings, electricity generation is subject to the EU ETS, while fossil fuels are not (until 2027). In addition, renewable energy or capacity mechanism levies are predominantly allocated to electricity. Such distortions discourage the adoption of energy efficient solutions, such as heat pumps, and obscure the dynamics of energy and grid use, making demand-side flexibility more difficult. The introduction of the ETS II seeks to address some of these imbalances in the transport and buildings sectors by ensuring that electricity, being an inherently efficient energy carrier, is appropriately priced compared to carbon-intensive fuels. However, potential tax distortions remain as Member States have discretion over additional carbon taxes and excise duties. The **planned recast of the Energy Taxation Directive** (COM(2021) 563 final), which is currently under negotiation, aims to address this issue by removing outdated exemptions and reducing taxes that favour fossil fuels.

[13] The ETS on fuels used in buildings and transport will be a separate system, with a separate price.

# 3 Background analysis – Croatia

## 3.1 EE1st in the NECP and in national legislation

The latest available NECP for Croatia is its draft update version submitted to the European Commission at the end of June 2023 (Croatia 2023). The draft is being updated after receiving the Commission's comments. The information provided hereafter are taken from the draft update of the NECP from June 2023. The draft NECP includes the term EE1st. Chapter 3.2 dedicated to the long-term renovation strategy for the decarbonisation of the building stock states that the decarbonization of buildings and the green and digital transition in the building sector shall be based above all on the principle of "energy efficiency first".

### 3.1.1 Buildings

In line with that, the draft updated NECP defines a new measure ENU-2: Promotion of decarbonization and application of the "energy efficiency first" principle in the building sector. The measure builds upon existing efforts of the Ministry of Physical Planning, Construction and State's Assets within an initiative "Partners' open dialogue" through which the various stakeholders from the public and private sector have signed the declaration of decarbonisation of buildings. New activities should include stronger promotion of the EE1st principle among these stakeholders and the organisation of campaigns that are targeting the general public on the need of applying the EE1st principle in the renovation of buildings.

The original NECP already defined several measures dedicated to the energy renovation of buildings. All these programmes have already been adopted by the Government in 2021 or 2022 and their implementation has started, predominantly through the use of funding sources allocated for the Recovery and Resilience Facility. While the original NECP and the draft updated NECP do not explicitly reference the EE1st principle in the description of these measures, they inherently align with the EE1st, since they are all based firstly on the reduction of the energy needs of a building and only then on the replacement of the existing building energy systems with RES-based and more efficient systems dimensioned for this new reduced energy demand. According to these programmes, it is not possible to obtain financial support solely for RES installations, if the building is not efficient: if its energy performance rating (as per heat demand) is D or worse in the continental region and C or worse in the coastal part of Croatia, then the building needs to firstly reduce its

energy demand. It is planned to emphasise this more in the description of the building renovation programmes in the final updated NECP.

### 3.1.2 Energy use scenarios

The EE1st principle is also mentioned in Chapter 4.1 of the draft updated NECP, that describes the scenario analyses of the future energy sector and GHG emissions development. It is explicitly stated that one of the main determinants of changes in the energy sector applied in creating projections of energy consumption of all forms of energy is increasing energy efficiency throughout the energy chain (production, transport/transmission, distribution and consumption of all forms of energy) and applying the EE1st principle. It has been further explained that, in addition to sector-specific measures on the final energy consumption side, the developed scenario also takes into account the effects of regulatory measures, which will have cross-sectoral effects, such as energy efficiency obligations, the efficiency of energy transformation through the construction of new cogeneration plants and high efficiency gas thermal power plants, and an increasing share of RES. Considering the transmission and distribution of electrical and thermal energy, an additional reduction of network losses is planned by 2030.

The draft updated NECP uses “end-use” modelling that starts from the useful current and future energy need of each sector and sub-sector, and then, with the application of the appropriate efficiency technologies and the predicted representation of energy sources, the final energy consumption is calculated. Two scenarios were defined. The scenario With Existing Measures (WEM) represents future trends in energy consumption in accordance with expected improvements in technology and structural changes in energy consumption and production, driven mainly by market principles and without the active government role in the design and implementation of new or strengthened energy-climate measures. The scenario With Additional Measures (WAM) assumes the implementation of an active policy to support the energy transition. This implies the implementation of the measures elaborated in the NECP.

### 3.1.3 Energy infrastructures

Based on the predictions of final energy consumption discussed above, the supply side is modelled. The PLEXOS model has been used for the long-term optimal investment and optimization of the power system and centralized heating systems and for the analysis/confirmation of the feasibility of power system operation on an hourly basis in selected characteristic years. The **least-cost principle** takes into account environmental constraints (including GHG emissions), energy security requirements, availability and current status of energy infrastructure, and the

influence of participation in the regional energy market (possible cooperation in the use of regional energy potential and sharing of infrastructure), when modelling the supply side. As the supply side planning is closely linked with the final energy consumption scenario, it may be stated that the EE1st principle has been applied. Moreover, as previously mentioned, improved efficiency and reduced losses in transformation, transmission, and distribution were also predicted.

In the NECP, there is **no reference to the decommissioning of gas networks**. On the contrary, the draft updated NECP envisages plans to increase LNG terminal capacity, which also includes the construction of a gas transport pipeline Zlobin-Bosiljevo. The pipeline will be able to transport hydrogen when production sources and market conditions for hydrogen consumption are developed. The construction of the aforementioned section of the gas pipeline will contribute to the security of gas supply in the Republic of Croatia, but will not increase the capacity for gas transportation to neighbouring countries. To enhance regional influence, gas transport pipelines towards Hungary and Slovenia are planned as well. It is also anticipated that there will be further development of gas transmission networks towards Energy Community countries, in particular Bosnia and Herzegovina. However, gas network is planned with a view on the future possibility of transporting hydrogen.

**Flexibility measures are included in the draft updated NECP but are not seen as a substitute for new infrastructure buildout** (network and generation). The need for energy storage capacity is planned to be met by the construction of battery storage at the level of transmission and distribution networks (20 MW) as well as investments in heat storage capacities at the level of district heating networks. Demand-side flexibility focuses on the distribution network. Planned pilots aim at analysing the impact of demand response on distribution networks and create stimulative regulatory frameworks for a wider implementation of flexibility measures.

### 3.1.4 Linking energy efficiency policies with infrastructure decisions

Dominant ‘classical’ energy efficiency policy measures in the Croatian draft updated NECP are already mentioned under building renovation programmes. Although the implementation details are not explicitly mentioned in the NECP, all these programmes are based on the requirement to reduce the heat demand (final energy) of a building at least by 50% compared to pre-renovation levels. This means that building envelope improvements are a must. Deep renovation that will reduce primary energy consumption of a building by 50% or more, or that will achieve nZEB standard after renovations are stimulated by higher co-financing rates. As said, this is not

explicitly stated in the draft updated NECP, as it is referred to other documents, *i.e.* building renovation programmes adopted by the Government. Buildings with poor energy performance (based on Energy Performance Certificates) cannot receive grants only for the replacement of building energy systems, without any action on the building envelope to reduce the heating demand. This is a clear demonstration of the EE1st principle, that is planned to be emphasised in the final updated NECP.

### 3.1.5 EE1st principle in national legislation

The EE1st principle has been explicitly mentioned in the Energy Efficiency Act (Official Gazette nr. 127/14, 116/18, 25/20, 32/21, 41/21) since its 2021 amendments, as a consequence of EED transposition. Article 2 of the Act states that in the design of sectoral policy measures, where applicable, the EE1st principle shall be applied. Art. 3 defines the EE1st principle, by taking over the definition from the Governance Regulation (EU) 2018/1999. It states that the principle can be understood as taking into account the potential for energy savings, whilst achieving the main targets of the analysed action. Apart from these provisions, there are no detailed elaborations of the principle nor any secondary legislations prescribing in more detail how to apply it.

The EE1st principle is also mentioned in the Act on Renewable Energy Sources and High Efficient Cogeneration (Official Gazette nr. 138/21, 83/23). Art. 2 states that when passing the relevant regulations and by-laws, it will be ensured that the approvals and permitting procedures applied contribute to the implementation of the EE1st principle.

There are no other pieces of legislation that explicitly mention the EE1st principle. However, there are legal acts relevant to the electricity and gas markets, that do stipulate consideration of energy efficiency at the supply side of the energy sector. The Electricity Market Act (Official Gazette nr. 111/21, 83/23) stipulates that the producer of electricity is obliged to create and publicly disclose a programme of measures for energy efficiency improvement, along with annual reporting on the results of its application. The same obligation is enforced to the operator of energy storage. The DSO and TSO have an obligation to include energy efficiency measures in their 10-year grid development plans and to report to the Regulatory Agency on the implementation on energy efficiency measures. Similar obligations related to energy efficiency inclusion in planning are stipulated for the gas transport and distribution system operators and gas storage operators via Natural Gas Market (Official Gazette nr. 18/18, 23/20). Similarly, the Energy Efficiency Obligation Scheme also contributes to the implementation of EE1st, as it requires energy suppliers to achieve energy savings among final customers. This means that energy suppliers need to include energy efficiency programmes in their portfolio of investments.

Apart from the legal acts mentioned above, that are relevant to the energy sector, there are no other identified legal acts mentioning the EE1st principle. Nevertheless, the Construction Act transposes the EPBD and deals with energy performance requirements of buildings, hence ensures the implementation of the principle in the renovation and construction of buildings. In the legislation relevant to the transport sector, apart from the Act on the Infrastructure for Alternative Fuels, there is no mention of energy efficiency let alone the EE1st principle.

## 3.2 Case study: EE1st in transmission grid planning

The Croatian Transmission System Operator – HOPS – is obligated to prepare the 10-year plan for the development of the transmission system grid. The Plan needs to be aligned with the NECP and take into account envisaged developments both on the supply and demand side. On the supply side, the expected electricity generation portfolio shall be taken into account and in particular the impact of intermittent RES shall be analysed. Apart from generation capacities, the future development of battery storage facilities will have an impact on the transmission grid, but also possible development of facilities for conversion of electricity into hydrogen (P2H) and other gases (P2X). The demand side influence on the transmission grid is based on the modelled future energy consumption in the end-use sectors. However, some specific aspects, like future development of e-mobility and its influence on the grid should be included in the analysis. The result should be the identification of critical transmission system facilities, that will enable the realisation of energy sector development scenarios as defined in the NECP. So, the first aim of this pilot case is to demonstrate the implementation of the EE1st principle in the transmission grid planning.

In addition, we plan to perform a cost-benefit analysis (CBA) of selected transmission grid projects. There is the ENTSO-E methodology in place for performing CBA (see ENTSO-E 2024a and 2024b), where the main benefits that need to be analysed are grid losses reduction and reduction of costs of expected energy not actually supplied. It will be investigated what other benefits (and costs) should be taken into account to comply with the EE1st principle. The specific project to test the implementation of EE1st into CBA is still to be determined.

The most recent transmission network development plan (2021-2031) takes into account energy efficiency and distributed RES and their impact on the reduction of energy consumption. The Plan includes a dedicated chapter on energy efficiency

measures to be undertaken in the transmission grid in this period, targeting a reduction of grid losses. The current Plan shall be revised, to ensure alignment with the final updated NECP.

As for CBA, it is always performed in line with the ENTSO-E methodology. A thorough analysis of that methodology will be performed within the pilot case to determine its compatibility with the EE1st principle.

Energy efficiency is not explicitly defined as an auxiliary service, but it is possible to purchase power reserve service not only from energy producers, but also from demand-side entities and aggregators. The NECP envisages further development of regulation in this segment.

# 4 Background analysis – Greece

## 4.1 EE1st in the NECP and in national legislation

### 4.1.1 EE1st in the NECP

The draft updated NECP (Greece 2023) was completed in October 2023 and mentioned that the achievement of the energy efficiency targets will be enabled by the application of the EE1st principle, prioritizing the selection of the most efficient policy measures and leading to multiple benefits, such as the reduction of energy costs, the improvement of thermal comfort conditions in buildings, the increase of employee productivity, the increase of domestic value added due to the employment impacts and the increased competitiveness of the products.

30 policy measures are planned for the promotion of energy efficiency (measures M1 to M30) without taking into consideration the policy measures in the transport sector, while targeted policy measures are foreseen for fostering the flexibility in the electricity market through the demand response scheme (measure M6) and the acceleration of energy storage systems (measure M2).

### 4.1.2 Energy use scenarios

The WAM scenario was examined and presented in the draft updated NECP without reference to the potential application of the EE1st principle. The modelling of the energy sector was done with the PRIMES model. PRIMES is a bottom-up model estimating the energy demand using different drivers, while the selection of the various technologies is performed taking into account different constraints in order to fulfil the different targets with the least cost. It should be noted that the energy saving target in 2030 is less ambitious (final energy consumption of 15.4 Mtoe) than the one that is expected according to Annex I of the EED (EU) 2023/1791 (final energy consumption of 14.6 Mtoe, *i.e.* stronger reduction than the target of not exceeding 15.4 Mtoe mentioned in the draft updated NECP).

Different energy efficiency and flexibility measures and policies have been included in the draft updated NECP without presenting information on the applied modelling approach or the quantitative estimates of their contribution to the achievement of the specified targets.

### 4.1.3 Energy infrastructures

There is no specific reference for the potential application of the EE1st principle in planning the development of the energy infrastructure. No plan for the decommissioning of gas networks has been mentioned, even if the draft updated NECP stated that the further extension of the gas distribution networks will be checked and assessed. No reference has been given for enabling energy efficiency and flexibility so as to avoid the development of new energy infrastructure.

No reference has been made on the potential interaction of the various policy measures in the different NECP dimensions. It should be noted that the measures for the improvement of energy efficiency in buildings and industry foresees also the exploitation of RES technologies. The modelling of the energy demand in the building sector is carried out assuming a predefined renovation rate and the selection of the technical systems is made on a least cost basis. For this reason, the number of renovated buildings is considerably lower than the number of installed heat pumps. The introduction of market-based instruments (Energy Efficiency Obligation Scheme and energy efficiency auctions) will incentivize the implementation of the most cost-effective energy efficiency interventions. As for the case of Croatia, it can be considered that the Energy Efficiency Obligation Scheme contributes to implement EE1st, since the energy suppliers need to include energy efficiency programmes in their portfolio of investments.

The EE1st principle has not been incorporated yet into the national legislative framework.

## 4.2 Case study: Heating and cooling planning

The first pilot case in Greece focuses on the heating and cooling planning and investment plans. More specifically, the contribution of energy efficiency and RES interventions will be evaluated compared to additional investments for natural gas infrastructure in terms of costs and benefits in order to avoid the potential problem of stranded assets and the consequences in the case that the cost-benefit impacts of the natural gas infrastructure would not be justified. The aim of the pilot case is to develop a structured planning process, which will enable and facilitate the identification of the most efficient demand-side resources that could partly or fully substitute the natural gas infrastructure and compare them with the types of infrastructures currently planned under national, regional and local planning. It should be noted that the application of the planning process will be carried out initially for the

case of residential and tertiary buildings, while the further expansion to other sectors will be scrutinized, such as industrial applications.

The integration of the planning process, developed in the framework of Enefirst Plus, within the heating and cooling planning and investment plans can be done through three different ways. Firstly, this planning process can be used initially during the update of the NECP according to the provisions of the Regulation (EU) 2018/1999. The application of the planning process will facilitate the control and evaluation of the further extension of the gas distribution networks as stated within the draft updated NECP. It has to be highlighted that the potential integration of the planning approach into the used models (such as PRIMES and TIMES) will be explored to ensure an holistic application of the EE1st principle.

Moreover, the planning process can also be taken into consideration during the conduction of the comprehensive assessment at national level and the preparation of regional and local heating and cooling plans at least in municipalities with a total population higher than 45,000, as foreseen by the Article 25 of the EED (EU) 2023/1791 (see section 2.3.1).

Finally, the approval of the development plans for new gas distribution networks and the extension of the existing ones by the Regulatory Authority of Energy should be based on the proposed planning process.

*Table 1. Projections about the use of natural gas in Greece (total and per sector) in the initial NECP (2019) and in the draft updated NECP.*

| | **2021 data** | **NECP 2019** | **Draft updated NECP** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **2030** | **2025** | **2030** | **2035** | **2040** | **2045** | **2050** |
| **Total consumption of gaseous fuels (TWh)** | 63.4 | 56.6 | 49.3 | 43.5 | 40.7 | 59.8 | 73.9 | 89.6 |
| **- Electricity and heat production (TWh)** | 43.4 | 36.1 | 28.2 | 20.9 | 6.8 | 9 | 9.8 | 12.3 |
| **- Industry (TWh)** | 8.3 | 5.9 | 7.2 | 7.7 | 7.6 | 11 | 10.8 | 10.4 |
| **- Non energy uses (TWh)** | 3.5 | 5.5 | 4.5 | 5.3 | 5.6 | 5.8 | 6.1 | 6.2 |
| **- Buildings, transport and agriculture (TWh)** | 8.1 | 9.1 | 9.4 | 9.6 | 9.6 | 13 | 14.2 | 16 |
| **- Production of synthetic fuels (TWh)** | - | - | 0 | 0 | 11.1 | 20.9 | 32.9 | 44.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Total natural gas consumption (TWh)** | 63.4 | 56.6 | 49.3 | 36.9 | 19.3 | 16.3 | 7 | 7.8 |

Sources: NECP 2019 and draft updated NECP (Greece 2023)

Even if the penetration of natural gas will be reduced according to the projections in the draft updated NECP compared to the previous forecast in the initial NECP from 2019, it is considered that natural gas will continue to have a meaningful role until 2030.

The existing comprehensive assessment, which was submitted by the Ministry of Environment and Energy in 2022 according to the provisions of Article 14 of the previous EED, concluded that the penetration of natural gas can be considered as one of the most cost-effective options for the exploitation of efficient heating and cooling. Moreover, targeted polices and measures are foreseen both in the existing NECP and the comprehensive assessment for the further deployment of natural gas in the end-use sectors. Nevertheless, the draft updated NECP does not include specific policies and measures on this matter.

It is worth noting that the role of district heating in Greece is not significant and is not expected to grow. The development plans of the natural gas distribution networks focus only on the economic profitability of the proposed investment without examining other alternatives based on the overall costs and benefits.

The development of the heating and cooling plans at national, regional and local level will be performed taking into account the proposed aspects of Annex X of the EED (EU) 2023/1791 in order to identify the potential for efficiency in heating and cooling according to the provisions of Article 25 EED. Moreover, the main principles described in Annex XI of the EED (EU) 2023/1791 about the conduction of the cost-benefit analyses, will also be applied.

Even if it is mentioned that the developed heating and cooling plans should be compliant with the EE1st principle, no further guidance on how the foreseen requirement will be fulfilled is provided both at national and EU level.

# 5 Background analysis – Italy

## 5.1 EE1st in the NECP and in national legislation

The EE1st principle is mentioned three times in the draft updated NECP (Italy 2023). It is referenced as a general objective for investment plans financed by the Structural Funds (See the section “Cohesion policy/Evolutionary lines”, p. 255). Two additional citations refer to the general alignment of policies to the EE1st principle, regarding the energy security dimension (p. 259, footnote 43) and the internal energy market dimension (p.270, footnote 45), as required by the Governance Regulation (EU) 2018/1999. The draft updated NECP lacks further details and does not mention the requirements set out by the new Article 3 of the EED (EU)2023/1791.

### 5.1.1 Energy use scenarios

The supporting technical document of the draft updated NECP published by the RSE[14] refers to the TIMES modelling approach which considers the impact of energy efficiency gains[15]. It claims to adopt the EE1st principle as a guiding element for decarbonisation strategies. However, specific instances and tools used for the application of EE1st in the construction of the scenarios, along with the selection of different (alternative) sets of assumptions, must be further investigated in the RSE documents.

### 5.1.2 Energy infrastructures

There is no specific reference to the application of the EE1st principle as guiding paradigm for the development of energy infrastructure, except for the general aspects mentioned in the draft updated NECP (*cf.* general alignment of the policies regarding the energy security dimension and the internal energy market dimension to the EE1st principle). In general, roll-out strategies take into account current needs of the energy system and future perspective of the global scenario.

[14] RSE SpA (Energy System Research) is a public research company indirectly controlled by the Ministry of Economy and Finance through its sole shareholder GSE SpA. Its research activity deals with the energy and sustainability chain, from primary energy sources to all conversion and use systems, from energy carriers to technologies for energy efficiency and storage.
[15] https://www.rse-web.it/rapporti/sviluppi-dei-modelli-times-di-rse/#

There is no specific mention regarding the establishment of synergies aimed at implementing the EE1st principle. The energy efficiency schemes for energy retrofitting of buildings reported in the draft updated NECP do not account for a EE1st approach for the definition of the renovation projects (*i.e.* about the selection of the types of intervention, and percentage of fiscal deduction expected or incentive rates).

### 5.1.3 EE1st principle in national legislation

The Italian Decree-Law n. 73/2020[16] "Implementation of Directive (EU) 2018/2002" and the amendment "Legislative Decree No. 102 of 4 July 2014" transposed the previous EED and dictate a series of efficiency improvement measures aimed at the national energy savings target and which contribute to the implementation of the EE1st principle, by ensuring that at least a minimum amount of energy savings is achieved.

As for the cases of Croatia and Greece, one of the policy measures reported by Italy to meet its target for Article 8 EED (EU) 2023/1791 is the Energy Efficiency Certificates (EEC) obligation scheme (commonly known as white certificates) managed by GSE[17]. Unlike in Croatia and Greece, the obligated parties in Italy are the DSOs (not the energy suppliers), and the scheme allows the trading of energy savings (white certificates scheme). In practice, the DSOs meet most of their energy savings obligation by buying white certificates that are most often produced by Energy Service Companies (ESCos). Nevertheless, this obligation makes that the DSOs need to allocate part of their revenues to acquiring white certificates (*i.e.* energy savings).

Other incentive mechanisms do not integrate the EE1st principle. For instance, the *Conto Termico*[18] promotes the implementation of interventions to increase energy efficiency and/or the production from renewable sources without a preliminary assessment of the various actions to maximize energy performance of buildings.

[16] https://www.gazzettaufficiale.it/eli/id/2020/07/14/20G00093/sg
[17] https://www.gse.it/en/what-we-do/energy-efficiency
[18] https://www.gse.it/servizi-per-te/efficienza-energetica/conto-termico

## 5.2 Case study: EE1st principle in Sustainable Energy and Climate Action Plans

The Italian pilot case examines, in two steps, the extent to which Sustainable Energy and Climate Action Plans (SECAPs) are consistent with EE1st and how EE1st could be further integrated into these plans. The first step would be to review a selection of well-documented SECAPs, to analyze criteria of measures' selection and prioritization, the emphasis placed on energy efficiency, and the level of ambition of the targets. This would provide the *status quo* about the current practices.

The second step would be a more detailed analysis of a sample of measures (selected from the first step) using a multi-dimensional evaluation, an integrated approach (planning, investement decision and market regulation), and a CBA methodology, all of them in line with EE1st. This would include an assessment of the impact on energy poverty, the third pillar of the Covenant of Mayors that will be mandatory from 2025. Moreover, point (b) of Article 3(5) of the EED (EU)2023/1791 requires that Member States "*address the impact on energy poverty*" when applying EE1st (see also section 2.1.2 about Article 3 EED). Hence the focus on the impact on energy poverty in the second step of this pilot case.

SECAPs are tools that allow municipalities to systematise their activities in line with the actions included in the plan, such as the adoption of Development Plans, Sustainable Mobility Plans, Green Plans, One-Stop-Shops, Municipal Building Regulations including Energy Regulations, and Water Plans. For these actions, there is a calculation of avoided $CO_2$ emissions and energy savings, as well as the related costs.

Italian participation to the Global Covenant of Mayors is very high. The JRC Data Base,[19] reports that the approximately 4,900 Italian signatories account for about half (47%) of the total. More than 4,000 SECAPs have been published in Italy.

Table 2 shows the status of Italian membership in the Covenant of Mayors broken down by municipal size class. Almost all the subscribing municipalities refer to municipalities with less than 50,000 inhabitants, submitting 96% of plans. On average, only 32% of the plans are being monitored.

[19] Data as of March 2023: https://data.jrc.ec.europa.eu/collection/id-00354

*Table 2. Subscribers and monitoring results of Italian SECAPs.*

| Size | Inhabitants | Subscribers | Inhabitants involved | Expected SECAP | Submitted SECAP | Submitting rate | Monitored SECAP | Monitoring rate |
|---|---|---|---|---|---|---|---|---|
| XXS | <=10k | 3 819 | 12 583 969 | 3 191 | 2 543 | 80% | 737 | 29% |
| XS | 10k to 50k | 884 | 17 657 636 | 879 | 702 | 80% | 275 | 39% |
| S | 50k to 100k | 96 | 6 505 465 | 104 | 85 | 82% | 32 | 38% |
| M | 100k to 500k | 46 | 8 316 741 | 53 | 44 | 83% | 28 | 64% |
| L | 500k to 1000k | 5 | 3 879 274 | 4 | 4 | 100% | 3 | 75% |
| XL | >1M | 2 | 4 212 009 | 2 | 2 | 100% | 1 | 50% |
| | **TOT** | **4852** | **53 155 094** | **4233** | **3380** | **70%** | **1076** | **32%** |

Source: ENEA processing on JRC data base – March 2023

Although the European initiative is predominantly local in nature for its implementation, it requires a national Steering Committee to harmonize and coordinate actions and to assist the related deployment[20]. ENEA, as national coordinator of the Covenant of Mayors, promotes networking activities involving the Covenant signatory municipalities and provides technical support to develop and implement SECAPs. ENEA's SECAPs Platform provides technical support to municipalities and local energy agencies in the implementation and management of their Plans.

Italian energy planning is coordinated with the local level through Regional Energy Plans which are an intermediate level between NECPs and SECAPs (municipal level). One of the problems over time has been the lack of coordination between the different levels of government. The work of coordinators and multi-level dialogue is essential to the implementation of the EE1st principle that requires engagement with various key stakeholders: regulatory bodies, electricity producers and energy suppliers, TSOs and DSOs, regional and local authorities, and consumers.

A dedicated reference to the SECAPS is provided in the draft updated NECP (Italy 2023, p.48): "*In view of the objectives to 2030, and later to 2050, it is also necessary to stimulate a more active role of the territorial authorities closest to the citizen. In*

[20] Since the first phase of the Covenant of Mayors, there has been a trailing effect from the larger and more structured municipalities, generators of examples and good practices, as well as a decisive role of the territorial coordinators (regions and provinces) and supporters, who assist municipal initiatives with guidance, coordination, and technical and economic support. The presence of support figures plays a crucial role in the adoption of an integrated approach to the programming of "area-based" initiatives that bridge the gap between regions and local authorities, as well as for the implementation of multilevel dialogues with regional and national governments.

*particular, through the exploitation and enhancement of the actions that these Authorities are carrying out within their Sustainable Energy Action Plans (SEAPs) and SECAPs, which are operational tools of the 'Covenant of Mayors'*".

There are experiences of deeper coordination between regional energy policies and SECAPs in some Italian regions. For example, Emilia-Romagna supports its municipalities in the implementation of BEIs (Baseline Emission Inventories) and makes the energy and environmental data of SECAPs consistent with the data of the Regional Energy Plan.[21] In Sicily, there is a similar level of consistency between regional and municipal data, with the use of an ENEA ICT platform.[22]

### *SECAP relevant regulations*

Some regions in Italy that are particularly active in their role as local coordinators have set up SECAPS' guidelines – in accordance with JRC Guidelines – adapted to their territory and provide technical support to signatories (see Table 3 below).

*Table 3. The Italian regional Covenant of Mayors guidelines.*

| **Region** | **Link to the regional guidance** |
|---|---|
| Veneto | https://www.venetoadapt.it/wp-content/uploads/2021/12/Linee-guida_Veneto-Adapt_compressed.pdf |
| Piemonte | https://www.regione.piemonte.it/web/temi/sviluppo/sviluppo-energetico-sostenibile/patto-dei-sindaci-piemonte |
| Puglia | https://www.regione.puglia.it/documents/44781/5313067/linee+guide_PAESC.pdf/5e16cfd5-04b2-6b04-ec6b-2ed5eaa4ff7a?t=1691592366797 |
| Emilia-Romagna | https://energia.regione.emilia-romagna.it/piani-programmi-progetti/politiche-europee/patto-dei-sindaci-2/manuale-paesc.pdf |

There is no explicit reference to EE1st in the JRC guidelines (JRC 2018)[23]. However, the SECAP aims to reduce primarily emissions associated with energy consumption (while non-energy emissions, *e.g.* associated with waste, are optional). To this end, the city is encouraged to take actions aimed at both reducing consumption and

[21] https://energia.regione.emilia-romagna.it/piani-programmi-progetti/politiche-europee/patto-dei-sindaci-2/patto-dei-sindaci#autotoc-item-autotoc-2

[22] https://pti.regione.sicilia.it/portal/page/portal/PIR_PORTALE/PIR_LaStrutturaRegionale/PIR_AssEnergia/PIR_DipEnergia/PIR_Struttura/PIR_Organizzazioneecompetenze/PIR_CompetAttivita/PIR_CompetenzeAreeServizi/PIR_Serv1Pianifprogrenerg/PIR_pattodeisindaci2/PIR_ModulisticaPAESC/programma%20di%20ripartizione%20PAESC.pdf

[23] Available at: https://eu-mayors.ec.europa.eu/en/resources/reporting

increasing production from RES. Hence, energy efficiency is certainly central to the SECAPs. The JRC guidelines report that electrification of consumption, both in the transport and buildings sectors, is also gaining importance in SECAPs. Currently, it does not monitor the EE1st principle.

### *Preliminary analysis*

The following criteria can help the selection for the sample of SECAPs to be analysed in the pilot case, with the aim of having good quality data, accuracy and availability of online information:

- Submission year (>2010, Italian Census 2011);
- Inhabitants number (>10,000);
- Mitigation and possibly adaptation pillar;
- 2030 or 2050 commitment target;
- SECAP or monitoring report (PDF) availability;
- Energy efficiency best practice in terms of energy savings and $CO_2$ avoided emissions % of total.

Complementary criteria might be considered, in a second step, to further focus the sample on cases that could provide examples where EE1st has been or could be implemented.

As a preliminary step, a first screening of all the SECAPs in ENEA database, filtering the ones meeting the above-mentioned requirements, selecting five SECAPs / signatories (see ), belonging to different regions and climatic zones.

*Table 4. SECAPs selected for a preliminary analysis.*

| Submission Year | Region | Climatic zone | Name | Population adhesion | 2020 | 2030 | 2050 | Adhesion type | Mitigation | Adaptation |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | Campania | C | Napoli | 970 438 | ☑ | ☒ | ☑ | Individual signatory | ☑ | ☒ |
| 2017 | Sicilia | E | Enna | 27 867 | ☑ | ☑ | ☒ | Individual signatory | ☑ | ☑ |
| 2015 | Sicilia | B | Messina | 246 000 | ☑ | ☑ | ☒ | Individual signatory | ☑ | ☒ |
| 2011 | Toscana | D | Firenze | 370 051 | ☑ | ☑ | ☒ | Individual signatory | ☑ | ☒ |
| 2011 | Veneto | E | Padova | 209 679 | ☑ | ☑ | ☒ | Individual signatory | ☑ | ☒ |

The qualitative evaluation of these five cases showed that the actions concern mainly energy efficiency or energy production from renewable sources, in line with the priority scope of SECAPs. The EE1st principle is not explicitly mentioned. A first assumption could be that SECAPs are likely designed according to where local authorities see possibilities for action, more than considering interactions between

the demand-side and supply-side of energy. This assumption would need to be further investigated in the pilot case, looking at the process to prepare the SECAPs (for example, whether they include the comparison of scenarios showing possible developments of the energy systems in the covered geographical area; or whether they consider the impacts that developments in energy demand and energy efficiency actions can have on energy systems, in terms of need in, or potential to avoid, new infrastructures).

A prerequisite for implementing EE1st is that decision makers are aware of demand-side options they can implement or support. The preliminary review of the five cases listed above confirms that energy efficiency measures are included in the portfolio of SECAPs, next to other types of measures (*e.g.* for RES). This shows that this prerequisite is met at least to some extent.

Typical examples of energy efficiency measures in the SECAPs and including implicity the EE1st idea, are:

- Raising awareness among the population to reduce consumption, including the different options of incentive schemes;
- Reduction of inner municipality trips using ICT, aiming at behavioural change (information desks, smart applications for public duties and utilities, *etc.*);
- Retrofit, modernisation or energy efficiency actions with the aim of reducing consumption for the same service (LED replacement, traffic light control plan, *etc.*);
- Energy rationalisation in the public sector (buildings and transport).

Further analysis is then needed to know how and why these measures have been selected, and whether this process considered the interactions with the supply-side, and especially the impacts they can have on the needs in energy infrastructures.

The next steps indeed concern how the plan is prepared and the analysis of its criteria and actions, focusing on aspects that can be related to the implementation of EE1st:

- Adhesion to a group of signatories or not;[24]

[24] The joint SECAP enables municipalities to pool resources for example to edit mobility plans, share technical skills, and engage in general joint local planning and advanced analyses. Coordinated actions at local level may enhance the impact on energy systems, particularly in dealing with stakeholders for network investments.

- Selecting criteria for SECAP, *e.g.* at least a monitoring report that can assure the robustness of technical assessment, and show the impacts considered (*e.g.* in terms of reductions in GHG emissions, investment in the local economy or energy production);
- How SECAP actions are assessed (*e.g.* cost-benefit analysis), and whether they are compared (and if so, how);
- A keyword indexing of the EE1st actions, for example based on the following questions related to implementing EE1st:

    1. Do the selected SECAPs consider EE1st in terms of demand-side flexibility?

        Flexibility referred to Art. 27 of the EED (EU)2023/1791 is in the hands of energy producers and distributors, actors that are little intercepted by municipalities in Italy. It will be investigated more closely whether there are any actions on flexibility in the SECAPs analysed.

    2. Do they consider sector coupling?

        Sector coupling has not been an element of the SECAPs that have been assessed in previous years. This will also be further checked for the SECAPs analysed in ENEFIRST Plus.

    3. Do they have an EE1st-compatible CBA?

        The preliminary analysis of the five SECAPs listed above did not find an EE1st compatible CBA method.

# 6 Background analysis – Poland

## 6.1 EE1st in the NECP and in national legislation

The term 'EE1st' is not explicitly used in any law or regulation. The first NECP[25] makes a very general reference to it stating that it "*aims to enable synergies from the implementation of actions in the five interrelated dimensions of the Energy Union, taking into account the principle of 'energy efficiency first'*". The NECP was published in December 2019 and is already outdated in many respects. According to the process of the Governance Regulation (EU) 2018/1999, an update of this document was due by 30 June 2023. In June 2023, the Ministry of Climate and Environment published a document for pre-consultation on updating the NECP and the Energy Policy of Poland until 2040. The EE1st principle was however not mentioned in this document.

In the draft updated NECP published in February 2024 (Poland 2024), the EE1st rule is mentioned for the first time in this document, in Chapter 2 ('Improving Energy Efficiency'), as follows:

> "*Reducing energy needs through changes in existing processes, as well as incorporating the principle of "energy efficiency first" in policy and investment planning, mean that energy efficiency can be treated as an energy resource. The benefits of reduced energy consumption result in the pursuit of increased energy efficiency being defined as the second dimension of the Energy Union*."
>
> "*At the same time, it is important to emphasize the importance of the 'energy efficiency first' principle introduced in EU Regulation 2018/1999. It should be applied, taking into account a system efficiency approach first and foremost, as well as a social and health perspective, while paying attention to security of supply, energy system integration and the pursuit of climate neutrality. As a result, the principle of 'energy efficiency first' should contribute to increasing the efficiency of individual end-use sectors and the energy system as a whole*."

These paragraphs provide a clear understanding of the EE1st principle. However, it is less clear how EE1st would have been taken into account in practice in the draft

[25] https://energy.ec.europa.eu/system/files/2020-08/pl_final_necp_part_1_3_en_0.pdf

updated NECP. This draft updated NECP is presented as a partial update. Therefore, more details could be provided with the final updated NECP due by 30 June 2024.

### 6.1.1 Energy use scenarios

In the draft updated NECP (Poland 2024, p.9), the WEM (With Existing Measures) scenario is presented as follows: "*The WEM scenario is understood as the baseline scenario of transition in market and technical conditions – the projections are realistic in technical, organisational and economic terms*". The document also stresses that the Polish "*economy still needs to develop and improve living standards, which makes it more difficult to reduce GHG emissions and energy consumption than in more developed economies. Consideration is also given to the continued presence of migrants from Ukraine in Poland, which has an impact on the increase in energy demand*".

In parallel, the WAM (With Additional Measures) scenario is developed as a normative scenario meant to meet all the targets set in the EU 'Fit-for-55' package, and with the aim of accelerating decarbonisation and reaching the climate neutrality pathway. According to the draft updated NECP, this leads to use in the WAM scenario technologies still immature and with an availability currently unknown.

Annex 1 to the draft updated NECP includes the details about the WEM scenario[26], and stresses that "*average energy consumption in Poland (per capita) is much lower than most of the developed Western European countries*. *Energy efficiency improvement measures implemented are only to some extent capable of reducing energy consumption. For this reason, further pro-efficiency measures are needed*".

More generally, nor the main report, nor Annex 1 of the draft updated NECP explains how the developments in the energy demand have been assessed for the WEM and WAM scenarios.

The draft updated NECP does not provide detailed information on how the higher ambition of the WAM scenario would be achieved, distinguishing between the WEM and WAM scenarios. The WAM scenario is presented as kind of benchmark, and not as a forecast. The key energy efficiency measures contributing to the reported effects are not identified. Moreover, the draft updated NECP does not include the details about the WAM scenario. Therefore, the table below can present only the projections included about the WEM scenario.

[26] Annex 2 about the WAM scenario was not available by the time of preparing this report.

*Table 4. Total primary and final energy consumption in the WEM scenario [in ktoe].*

| Primary energy consumption | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
| 100 195 | 96 859 | 103 950 | 103 842 | 103 734 | 103 734 | 103 734 | 98 973 | 94 123 | 89 453 | 84 692 | 79 932 |
| **Final energy consumption** | | | | | | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** |
| 73 730 | 71 145 | 75 154 | 75 428 | 75 703 | 75 978 | 75 978 | 72 488 | 68 999 | 65 510 | 62 021 | 58 532 |

Source: draft updated NECP (Poland 2024). Data for years 2019-2021 are from EUROSTAT, while years 2022-2030 represent indicative trajectory.

Nevertheless, as in the cases of Croatia, Greece and Italy, one of the policy measures reported by Poland to meet its energy savings target for Article 8 EED (EU) 2023/1791 is an Energy Efficiency Obligation Scheme. The Polish scheme allows the trading of energy savings (white certificates scheme). The energy suppliers can meet their obligation either by producing directly white certificates (with their own energy efficiency programmes or subcontracted programmes), by buying white certificates on the market, or by paying a buy-out fee. These fees go to the national environment fund (NFOŚiGW) that implements energy efficiency programmes (among other porgrammes). This requirement mandates energy suppliers to allocate funding to energy savings, either directly or indirectly.

### 6.1.2 Energy infrastructures

As there is currently no legal provision in Polish legislation imposing the consideration of the EE1st principle in the energy sector, it is only up to the entities responsible for energy planning and determining the size of the infrastructure to possibly take this principle into account. In the draft updated NECP, there is no information on the interaction between energy demand and infrastructure planning. There is no indication of specific targets, for example, for the decommissioning of the gas network, or for investment in non-wire solutions. There are only some mentions of network flexibility, but they are not very specific. The draft updated NECP does not deal directly with local energy planning.

### 6.1.3 Linking EE policies with infrastructure decisions

Improving the energy efficiency of buildings is primarily achieved by insulating the building envelope and reducing its energy demand. The building envelope and technical equipment must meet minimum thermal insulation requirements set out in the Regulation on the technical conditions. According to this regulation, a new residential building must have a non-renewable primary energy demand of less than 70 kWh/m$^2$/year. There are also requirements for heat transfer coefficients depending on the type of partition and the room temperature, as well as coefficients for windows, balcony doors and external doors. The regulations are formulated in such a way that it is only possible to meet the requirements if thermal insulation is properly selected together with the use of renewable energy sources for heating and ventilation systems. Insulation alone will not allow the standards to be met, as only equipment utilizing renewable energy can further reduce primary energy consumption. Support policies directly aimed at supporting the development of small-scale RES are not linked to energy efficiency improvements and do not prevent lock-in effects.

The reference made in the draft updated NECP about Poland's long-term renovation strategy published in 2022 highlights the priority of eliminating the use of coal in residential buildings. In addition to the objective of reducing GHG emissions, this priority on phasing out the use of coal is also linked to the objective of improving local air quality. This priority might conflict with the EE1st principle.

More generally, the EE1st principle has not yet been included in any piece of national legislation.

## 6.2 Case study: cooperation between DSOs and prosumers for a smart integration of Decentralized Energy Resources

The Polish case study assesses the expectation of small users, especially prosumers, participating in Demand-Response (DR) programmes in Poland. These programmes are implemented by Polskie Sieci Elektroenergetyczne (DSO) and include demand reduction at the request of the TSO in two variants:

- **Guaranteed programme** – aimed at entities that can guarantee the implementation of reductions during the contract period. Entities receive a fixed monthly income for their willingness to undertake a reduction and receive an additional payment if the reduction is implemented;
- **Ongoing Programme** – less binding and aimed at customers who want to familiarise themselves with how the mechanisms work, identifying and using their reduction potential. The customer can decide whether to use the reduction capacity available to them, and if they do, they receive the payment.

One of the main objectives of the programmes mentioned above is to explore users' preferences and willingness to participate in such programmes. Other objectives include the characteristics of prosumers that influence their willingness to participate in DR programmes; barriers and drivers for small users in DR programmes. Whether a small user participates in a particular DR programme may depend on various factors, such as financial incentives, environmental awareness and technological access. In particular, prosumers may have different levels of willingness to participate based on these factors.

### *Decentralized Energy Resources policies*

The billing system for prosumers of photovoltaic energy has been changed as of 1 April 2022. It is currently based on net-billing, which is less financially viable for prosumers and extends the payback period by several years. Apart from the above-mentioned billing system, there is no other incentive. Net-billing is a more secure solution for electricity system operators, because under the previous billing system there were situations where prosumers injected too much energy into the grid and overloaded it. This often resulted in physical damage to the grid (*e.g.*, fires). The current solution forces more action on the part of prosumers to develop local energy storage.

According to the Renewable Energy Sources Act, the prosumer can inject electricity into the grid at any time but does not get compensation for it. Once the photovoltaic system has been installed, the distribution network operator must receive an application for the connection to the grid. All RES system with an installed capacity between 50 kW and 1 MW must be registered at the Energy Regulatory Office. It currently lists 3,070 energy producers, of which 2,271 use small-scale photovoltaic systems. For all other RES micro-installations (under 50 kW) connected to the grid, the relevant distribution system operator must be notified.

From August 2021, inverters must be NC RfG (Network Codes Requirements for Generators) certified in accordance with the requirements of the DSO.

Inspections of micro-installations belonging to prosumers are possible. The operator can check the micro-installation: the approved/reported capacity, the voltage when generating electricity and feeding energy into the grid without a contract. Last year

(2023), these checks became quite frequent because some users changed the inverter mode to generate more energy, which led to an overload on the grid. It can be curtailed according to the conditions in the contract but not remotely.

Injection must comply with the permit issued. They must not be higher, as this will lead to overloading of the network. For individuals, the maximum capacity of the system should not exceed 50 kW. This limit allows them to benefit from prosumer status. The limit is adapted individually for each installation, depending on its capacity.

# 7 Conclusion and perspectives

The Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action established **EE1st** primarily as an **overarching principle for the NECPs**[27], also specifying that the policies and measures for energy security and the internal energy market shall reflect the EE1st principle. This ground was then complemented in September 2021 with the Commission Recommendation (EU) 2021/1749 that includes general **guidelines** for the main sectors relevant to implementing EE1st in decision-making.

Article 3 in the new Energy Efficiency Directive (EED (EU) 2023/1791) brings a **stronger legal basis**: it clarifies that EE1st shall become a common principle to any decision with a significant impact on energy systems (planning, policy and major investment decisions). This article also introduces **monitoring and reporting requirements**, showing implicitly that this is not the current practice. Overall, this article sets a clearer ground for the implementation of EE1st: demand-side resources (energy efficiency and demand-side flexibility) shall be considered **more systematically** in the assessments for decision-making (*cf.* mandatory implementation for "major investments"), using **cost-benefit methodologies** that include **wider benefits** and a long-term perspective in their scope of analysis.

The Electricity Directive (EU) 2019/944 and Regulation (EU) 2019/943 provide a rather comprehensive framework for implementing EE1st in the **power sector**. However, the transposition of the related provisions has been slow and uneven across the Member States so far. Whereas this is essential for demand-side resources to have a non-discriminatory and transparent access to power markets.

Article 27 of the new EED complements the EE1st relevant provisions of the Electricity Directive and Regulation, highlighting the **role of National Regulatory Authorities**: about the design of network tariffs, providing methodologies and guidance on how to assess alternatives in Cost-Benefit Analysis, checking compliance with EE1st when approving development or investment plans. The publication at the end of 2023 of the EU Grid Action Plan highlights the importance of anticipating future needs in network infrastructure, considering alternatives.

The approach updated in the new EED for efficiency and RES in **heating and cooling** supply follows a logic in line with EE1st: first comparing the options (*cf.* **comprehensive assessments**), then taking "adequate measures" to ensure that the

[27] See Article 3(3): "*With regard to their integrated national energy and climate plans, Member States shall:* (…) *(b) take into account the interlinkages between the five dimensions of the Energy Union, in particular the energy efficiency first principle*".

cost-effective potentials are used (Article 25(4) and (5) of the EED). Comprehensive assessments are now part of the NECP, and Article 25(1) requires a joint preparation with the assessment of RES potentials (required by the Renewable Energy Directive). In Annex X of the EED, the link is also made with the former national long-term renovation strategies (now **National Building Renovation Plans** in the new EPBD). However, the first National Renovation Plans will be prepared later than the final updated NECP due by 30 June 2024 (due to late adoption of the new EPBD on 12 April 2024). The upcoming update of the comprehensive assessments might therefore not use an updated estimation of the targeted evolution of the heating and cooling demands from buildings.

Article 25 of the EED also newly requires that regional and local authorities of more than 45,000 inhabitants prepare **local heating and cooling plans** that should comply with the EE1st principle. These plans could bring the linkage and coordination between the main directions derived from the comprehensive assessment at national level and local implementation. These plans could also be a major opportunity to implement EE1st by considering jointly the possible actions on the demand (*e.g.* building renovations) and supply (*e.g.* development of district heating) of heating and cooling.

The new EPBD refers more explicitly to EE1st, and especially about **building renovations**. At national level, the Building Renovation Plans should be in line with EE1st, with the objective of a highly energy-efficient and decarbonised building stock by 2050 (long-term perspective) and considering wider benefits. For the building owners, the Building Renovation Passports should provide them with an assessment of the suitable energy efficiency and RES measures. Building owners can then compare the options framing the buildings' energy demand (*cf.* building envelope) and the options to meet the energy demand (*cf.* technical systems of the building).

Another important point in the new EPBD is the requirement for Member States to present their measures to **phase-out fossil fuels in heating and cooling**, and more specifically for a complete phase-out of fossil fuel boilers by 2040. This will have major implications for gas, power and heat networks, and therefore represent an important topic for the implementation of EE1st.

The revision of the EU ETS Directive will introduce a separate system (ETS II) from 2027 to cover the use of fossil fuels in road transport and buildings, which is expected to provide a **more effective carbon price signal**, and thereby that assessments for investments should more systematically consider the impact on GHG emission. The internalisation of this impact in the price of energy provides a fairer ground when comparing the cost-effectiveness of demand-side and supply-side measures.

Overall, the new provisions from the various pieces of the 'Fit-for-55' package **strengthen the basis and requirements to implement EE1st**. They also highlight key areas where EE1st should be systematically considered.

The **first set of pilot cases** developed in Enefirst Plus will explore some of these areas:

- Transmission network development plan and cost-benefit analysis for transmission grid projects (Croatia);
- Heating and cooling plans (Greece);
- Sustainable Energy and Climate Action Plans of municipalities (Italy);
- Cooperation between DSOs and prosumers (Poland).

The preliminary analysis of the background on EE1st in each country shows **diverse situations**. EE1st is explicitly mentioned in Croatia's Energy Efficiency Act, whereas the EE1st principle has not been incorporated yet into Greece's legislative framework. As assessed by the European Commission, the way EE1st has been addressed in the draft updated NECPs remains often in general terms, without clarifying how EE1st would be implemented in practice. This does not necessarily mean that EE1st would not yet be considered, as shown by the example of the Croatian renovation programmes.

The pilot cases of Enefirst Plus therefore represent valuable opportunities to **further investigate the potential for implementing EE1st**, as well as to improve the related reporting.

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# Table of acronyms

| Acronym | Description |
|---|---|
| **ACER** | Agency for the Cooperation of Energy Regulators |
| **BACS** | Building Automation and Control Systems |
| **BRP** | Building Renovation Passport |
| **CBA** | Cost-Benefit Analysis |
| **DER** | Decentralized Energy Resources |
| **DHC** | District Heating and Cooling |
| **DR** | Demand-Response |
| **DSO** | Distribution System Operator |
| **EE1st** | Energy Efficiency First |
| **EED** | Energy Efficiency Directive |
| **EPBD** | Energy Performance of Buildings Directive |
| **ESCo** | Energy Services Company |
| **ETS** | Emission Trading Scheme |
| **EU** | European Union |
| **GHG** | Greenhouse gases |
| **NECP** | National Energy and Climate Plan |
| **P2H** | Power-to-Hydrogen |
| **P2X** | Power-to-Other form(s) of energy |
| **RED** | Renewable Energy Directive |
| **RES** | Renewable Energy Sources |

| | |
|---|---|
| **SECAP** | Sustainable Energy and Climate Plan |
| **TPA** | Third Party Access |
| **TSO** | Transmission System Operator |
| **WAM** | With Additional Measures |
| **WEM** | With Existing Measures |

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