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COMMISSION RECOMMENDATION (EU) 2024/2143

of 29 July 2024

setting out guidelines for the interpretation of Article 3 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the energy efficiency first principle

(notified under document C(2024) 5284)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

(1) Directive 2012/27/EU of the European Parliament and of the Council ([1]) introduced a requirement to achieve the headline target of at least 32,5 % energy savings at Union level by 2030.

(2) Directive (EU) 2023/1791 of the European Parliament and of the Council ([2]) was adopted on 13 September 2023. It recast Directive 2012/27/EU, keeping some of its provisions unchanged while, at the same time, introducing some new requirements. In particular it significantly raised the level of ambition for 2030 in terms of energy efficiency, including in relation to the energy efficiency first principle.

(3) The energy efficiency first principle is defined in Regulation (EU) 2018/1999 of the European Parliament and of the Council ([3]) and is at the core of the EU Strategy for Energy System Integration ([4]). Directive (EU) 2023/1791 strengthens the principle and, for the first time sets conditions for its practical application.

(4) To have the desired impact, the energy efficiency first principle needs to be consistently applied by national, regional, local and sectoral decision makers in all relevant scenarios and policy, planning and major investment decisions – that is to say large-scale investments with a value of more than EUR 100 000 000 each or EUR 175 000 000 for transport infrastructure projects – affecting energy consumption or supply. The principle needs thus to be applied in both the energy and non-energy sectors.

(5) Nevertheless, Member States could expand the application of the principle, for example by lowering the aforementioned thresholds or by setting lower thresholds for specific sectors and project types, if they consider that a substantial energy efficiency potential would remain untapped for those sectors and project types.

(6) The proper application of the principle requires using the right cost-benefit analysis methodology for a wider set of economic, social and environmental impacts, setting enabling conditions for energy efficient solutions and enabling the proper monitoring of the applications of the principle by identifying an entity or entities responsible for this monitoring in each Member State. Cost-benefit analysis methodologies should be systematically developed and

([1]) Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (OJ L 315, 14.11.2012, p. 1, ELI: http://data.europa.eu/eli/dir/2012/27/oj).

([2]) Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (OJ L 231, 20.9.2023, p. 1, ELI: http://data.europa.eu/eli/dir/2023/1791/oj).

([3]) Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1, ELI: http://data.europa.eu/eli/reg/2018/1999/oj).

([4]) Established in the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Powering a climate-neutral economy: An EU Strategy for Energy System Integration, COM(2020) 299 final.

carried out, should be based on the most up-to-date information on energy prices and should include scenarios for rising prices, such as due to the application and expansion of the Union's emission trading system (EU ETS) pursuant to Directive 2003/87/EC of the European Parliament and of the Council ([5]), in order to provide an incentive to apply energy efficiency measures.

(7) Priority should be given to demand-side flexibility and solutions that are more cost-effective than investments in energy supply infrastructure in meeting policy objectives. Impacts on energy poverty should be assessed. Member States should take into account potential benefits from demand-side flexibility in applying the energy efficiency first principle and, where relevant, consider demand response at both centralised and decentralised level, energy storage, and smart solutions as part of their efforts to increase efficiency of the integrated energy system.

(8) Member States can choose at their discretion the way of transposing and implementing the requirements regarding energy services, that is best suited to their national circumstances. In this context, it would be recommended to interpret the relevant provisions of Directive (EU) 2023/1791 in a consistent way which would contribute to a coherent understanding of Directive (EU) 2023/1791 across Member States as they prepare their transposition measures.

(9) Commission Recommendation (EU) 2021/1749 ([6]), particularly its Annex, contains relevant guidelines and examples for the implementation of the energy efficiency first principle in decision-making in the energy sector and beyond.

HAS ADOPTED THIS RECOMMENDATION:

1. Member States should follow the interpretative guidelines in the Annex to this Recommendation when transposing Article 3 of Directive (EU) 2023/1791 in their national law.

Done at Brussels, 29 July 2024.

For the Commission
Kadri SIMSON
Member of the Commission

([5]) Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (OJ L 275, 25.10.2003, p. 32, ELI: http://data.europa.eu/eli/dir/2003/87/oj).

([6]) Commission Recommendation (EU) 2021/1749 of 28 September 2021 on Energy Efficiency First: From principles to practice – Guidelines and examples for its implementation in decision-making in the energy sector and beyond (OJ L 350, 4.10.2021, p. 9, ELI: http://data.europa.eu/eli/reco/2021/1749/oj).

ANNEX

1. **INTRODUCTION**

These guidelines provide guidance to Member States on how to interpret Article 3 of Directive (EU) 2023/1791 when transposing it into their national law. Nonetheless, the binding interpretation of Union legislation is the exclusive competence of the Court of Justice of the European Union.

Article 3 of Directive (EU) 2023/1791 requires Member States to ensure the assessment of energy efficiency solutions in planning, policy and major investment decisions in both energy and non-energy sectors. The Article also requires the establishment of monitoring mechanisms, the promotion of cost-benefit methodologies, and the removal of barriers to the implementation of the Energy Efficiency First (EE1st) principle. Energy efficiency solutions should go beyond end-use energy savings, covering also demand-side resources (demand response, energy storage, smart solutions) and the efficient conversion, transmission and distribution of energy. It is expected that Member States, by transposing Directive 2023/1791, will incorporate the EE1st principle in their decision-making and permitting processes and apply it in all relevant future planning, policy and major investment decisions.

2. **LEGAL AND POLICY CONTEXT**

The EE1st principle, as defined in Article 2, point (18), of Regulation (EU) 2018/1999, is based on the premise that strategic investments in energy efficiency can cost-effectively reduce demand, thereby reducing the need for, and costs associated with, additional energy production and infrastructure.

As stated in recital (15) of the preamble to Directive (EU) 2023/1791, the EE1st principle is an 'overarching principle that should be taken into account across all sectors […]. 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.'

Recommendation (EU) 2021/1749, which is relevant to Article 3 of Directive (EU) 2023/1791, sets out specific tools and actions to assist Member States in implementing the EE1st principle. Article 3(3) of Directive (EU) 2023/1791, encourages Member States to take account of that recommendation.

Article 3 is interlinked with Article 7 of Directive (EU) 2023/1791 which requires Member States to ensure that in concluding public contracts and concessions with a value equal to or greater than the thresholds laid down in Article 8 of Directive 2014/23/EU ([1]), Article 4 of Directive 2014/24/EU ([2]) and Article 15 of Directive 2014/25/EU ([3]) of the European Parliament and of the Council, contracting authorities and contracting entities apply the EE1st principle.

Article 3 is also interlinked with Article 27 of Directive (EU) 2023/1791 pursuant to which Member States are to ensure that gas and electricity transmission and distribution system operators apply the EE1st principle, in their network planning, network development and investment decisions. Article 27 also requires national energy regulatory authorities to apply the EE1st principle in carrying out the regulatory tasks provided for in Directives 2009/73/EC ([4]) and (EU) 2019/944 ([5]) of the European Parliament and of the Council regarding their decisions on the operation of the gas and electricity infrastructure, including their decisions on network tariffs.

([1]) Directive 2014/23/EU of the European Parliament and of the Council of 26 February 2014 on the award of concession contracts (OJ L 94, 28.3.2014, p. 1, ELI: http://data.europa.eu/eli/dir/2014/23/oj).

([2]) Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC (OJ L 94, 28.3.2014, p. 65, ELI: http://data.europa.eu/eli/dir/2014/24/oj).

([3]) Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (OJ L 94, 28.3.2014, p. 243, ELI: http://data.europa.eu/eli/dir/2014/25/oj).

([4]) Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC (OJ L 211, 14.8.2009, p. 94, ELI: http://data.europa.eu/eli/dir/2009/73/oj).

([5]) Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (OJ L 158, 14.6.2019, p. 125, ELI: http://data.europa.eu/eli/dir/2019/944/oj).

3. TERMS AND CONCEPTS USED IN THESE GUIDELINES AND IN ARTICLE 3 OF DIRECTIVE (EU) 2023/1791

3.1. The difference between planning, policy and major investment decisions

Neither Directive (EU) 2023/1791 nor Recommendation (EU) 2021/1749 make an explicit delineation between planning, policy, and major investment decisions. The following explanations are based on the considerations of the Commission services and are given by way of indication only. Table 1 summarises the characteristics of planning, policy and major investment decisions.

Table 1

Comparison of planning, policy and major investment decisions

Decision Type	Description	Examples	Key consideration
Planning decisions	High-level strategic choices regarding energy systems and non-energy sectors, focusing on trends, feasibility, and evaluation of energy solutions.	Public planning: integrated national energy and climate plans referred to in Article 3 of Regulation (EU) 2018/1999 ([1]); ten-year network development plans; national transport planning; sustainable urban mobility plans; local heating and cooling plans referred to in Article 25, paragraph 6 of Directive (EU) 2023/1791 Private planning: strategic business planning; real estate planning; fleet planning	Do not necessarily involve specific financial commitments to projects.
Policy decisions	The development, review, and implementation of policies with a significant impact on energy consumption and of regulations by national, regional, and local governments	Financing schemes; energy market design and regulation: standards and norms; energy and CO_2 taxes; information and awareness measures.	Ensuring that existing and new policies are in line with the EE1st principle.
Major investment decisions	Commitment to specific, individual projects with concrete financial implications.	Network infrastructure; electricity transmission interconnector line; large-scale offshore wind farm; hydrogen production capacities, large-scale energy storage, building development project, new or extended infrastructure for air transport, new highways.	Tangible projects with allocated financial resources.

([1]) Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council (OJ L 328, 21.12.2018, p. 1, ELI: http://data.europa.eu/eli/reg/2018/1999/oj).

3.2. **Expenditure that falls under major investment decisions**

A major investment decision concerning a physical asset, whether related to energy systems or non-energy sectors, involves capital expenditure (CAPEX). This includes costs associated with acquiring or upgrading physical assets, such as purchasing machinery or equipment, land acquisition, and costs for the construction or installation of the infrastructure. It could also encompass design and engineering costs, permits, and initial training costs for operating the new equipment or infrastructure. These are upfront costs which provide value over a long period of time.

Excluded from those upfront investments are the operating expenses (OPEX), which are the ongoing costs for running a product, business, or system. In the context of an infrastructure project, OPEX would include energy costs, routine maintenance and repairs, personnel costs, and other expenses related to the day-to-day operation of the infrastructure. These are not usually considered in the initial investment decision as they are recurrent, often variable costs that are incurred for the actual operation of the asset once it has been installed and is in use.

Directive (EU) 2023/1791 does not include any specifications on whether CAPEX and/or OPEX have to be considered to define major investment decisions. Thus, all relevant expenses – whether CAPEX, OPEX or any other type – should be taken into account.

3.3. **Phased infrastructure projects in the context of major investment decisions**

Phased infrastructure projects, such as the construction of wind farms or highways, should be treated as a single investment decision and the total CAPEX for all components should be taken into account to determine whether the project exceeds the major investment thresholds set out in Article 3(1) of Directive (EU) 2023/1791.

For instance, even though each wind turbine within a wind farm might independently generate and supply power, the entire wind farm project represents a single investment decision. Similarly, a multi-year highway construction project should be considered in its entirety for investment evaluation, regardless of whether individual sections can operate independently.

3.4. **Non-energy sectors**

Non-energy sectors are those areas of the economy that do not primarily deal with the production, transmission, distribution, or sale of energy. While those sectors consume and depend on energy for their operations, their main function is not centred on energy production or supply. Article 3(1) of Directive (EU) 2023/1791 provides a non-exhaustive list of examples of non-energy sectors, which includes buildings, transport, water, information and communications technology, agriculture, and the financial sector.

According to the Eurostat energy balance methodology ([6]), non-energy sectors could be understood as those involved in final consumption of energy (Eurostat code FC_E). Those sectors comprise the industry sector (FC_IND_E), the transport sector (FC_TRA_E), and other sectors (FC_OTH_E), such as commercial & public services, households, agriculture and forestry, and fishing. Therefore, the indicative list in Article 3(1) could equally be aligned to the Eurostat energy end-use sectors, or to a national grouping of energy end-use sectors.

4. **OBLIGATIONS UNDER ARTICLE 3**

4.1. **What energy efficiency solutions to assess?**

Energy efficiency solutions could be understood as technologies, processes and practices that reduce or shift over time the amount of energy required to provide the same level of performance, service, or goods. It follows from Article 2, point (18), of Regulation (EU) 2018/1999 in conjunction with Article 3(1) of Directive (EU) 2023/1791 that such solutions could include:

(a) **end-use energy savings**, such as, but not limited to, insulation and other energy-saving improvements to buildings, modal shift, fuel-efficient vehicles, energy-saving appliances and devices, efficient motor systems and heat recovery;

([6]) European Commission, Energy balance guide, Methodology guide for the construction of energy balances & Operational guide for the energy balance builder tool, 2019.

(b) **demand-side resources and system flexibilities**, which might involve elements like demand response, energy storage (including batteries and thermal storage), and smart solutions (for example, smart meters, smart thermostats);

(c) **efficient conversion, transmission and distribution of energy**, incorporating approaches such as the reduction of network losses, smart grid deployment, and efficient district heating and cooling.

Article 3(1) requires Member States to ensure that energy efficiency solutions, where they are available and can meet the same specific need or policy objective, are assessed in planning, policy and major investment decisions. Member States could, for example, regularly update studies about energy savings potentials, and make available to planners and investors up-to-date catalogues of energy efficiency solutions. The following tables provide some examples of possible alternatives or complementary solutions to plans for additional infrastructure developments in energy systems (Table 2) and non-energy sectors (Table 3), respectively. They are not exhaustive lists.

Table 2

Examples of alternatives in the energy system when applying the EE1st principle

Sector	Plans for additional infrastructure development	Possible alternatives / complementary solutions
Electricity	— generation (conventional and renewable power plants, cogeneration plants) — transmission and distribution (high-voltage transmission lines, substations, interconnectors, transformers, etc.) — storage (pumped hydro storage, battery storage, etc.)	— demand-side flexibility/demand response (for example, electric vehicles demand management, responsive/bidirectional charging, flexible heat pumps, Time-of-Use energy tariffs and services for demand-response aggregation) — smart grid technologies, including advanced metering infrastructure — end-use energy savings (for example, efficient appliances and devices, lighting)
Gas	— production (gas fields, offshore platforms, shale gas extraction sites, hydrogen infrastructure) — transmission and distribution (pipelines, compressor stations, interconnectors) — storage (underground gas storage facilities, liquefied natural gas terminals)	— end-use energy savings (for example, insulation of buildings) — electrification of heating systems and transport modes (which has inherent system efficiency benefits) — reduction in network losses
Heat	— generation (conventional boilers, ovens, cogeneration) — networks (pipes, heat exchangers, pumps, substations) — storage (thermal energy storage, phase change materials, etc.)	— end-use energy savings (for example, insulation of buildings) — system integration and system efficiency (for example, power-to-heat) — renewable energy sources (for example, heat pumps, geothermal, solar-thermal energy) — waste heat recovery — renewable district heating

Table 3

Examples of alternatives in the non-energy sectors when applying the EE1st principle

Non-energy sector	Plans for additional infrastructure development	Possible alternatives / complementary solutions
Buildings	— large-scale construction (for example, commercial buildings, residential complexes, public facilities like schools) involving decisions on heating, ventilation, and air conditioning systems	— energy renovations of existing buildings — mapping of available (unused) buildings before new constructions — energy efficient construction (incl. nearly zero energy building, zero emissions buildings) — building automation and control systems (for example, smart thermostats, occupancy sensors) — efficient heating systems (for example, heat pumps, district heating) — passive cooling solutions (for example, sun shading, thermal mass, night cooling, natural ventilation and lighting) — energy efficient lighting and appliances — renewable energy integration (for example, PV, solar thermal) — triggering behavioural change in use of energy — smart charging systems
Transport	— major transport infrastructures (for example, motorways, railways, airports, ports and maritime infrastructure)	— public transportation (for example, urban and sub-urban mass transit systems, intercity rail connections, bus fleets) — cycling and pedestrian infrastructure (for example, bike lanes, bike-sharing systems) — consolidation of cargo — mobility management (for example, car-sharing programs, stimulating higher occupancy of vehicles) — support for multimodal (combined) transport — measures stimulating an increased use of energy efficient modes of transport — fleet electrification — electric vehicle charging infrastructure

Industry	— construction of new industrial sites — use of new fuels and energy consuming processes	— promotion of efficient industry sector integration and clustering at local level — flexible operation via demand response and self-consumption — reuse of waste heat and cold — electrification and 'no-regret' use of energy fuels
Water	— water supply (for example, desalination facilities) — wastewater treatment plants — water distribution networks (for example, pipes, pumping stations)	— water savings (for example, water-efficient agriculture practices) — energy efficient pumps, motors and treatment facilities — reduction in network losses — smart water networks and pressure management systems — rain- and grey-water usage in buildings
ICT	— data centres (for example, energy use for computing, cooling) — telecommunications infrastructure (for example, broadband networks, mobile systems)	— energy efficient data centre design and operation (incl. waste heat recovery) — energy-efficient networking equipment — smart grid technologies and digital solutions for energy management
Agriculture	— irrigation systems (for example, surface sprinklers) — farm machinery and equipment (for example, combine harvesters, tractors) — greenhouses, vertical farms	— adapting the choice of crops to local climate, taking into account climate change — agriculture practices limiting the need for machinery and equipment (for example, permaculture) — energy efficient irrigation (for example, solar-powered pumps) — precision agriculture (for example, GPS-guided machinery) — renewable energy use (for example, solar drying, solar panels)

4.2. **How to assess energy efficiency solutions?**

Assessing energy efficiency solutions in policy, planning or major investment decisions means that such solutions should be considered and evaluated as part of the decision-making process. The use of cost-benefit analysis (CBA) for the assessment of energy efficiency solutions could include:

(a) **technical analysis**: identification and evaluation of the technical feasibility, performance, and implementation requirements of potential energy efficiency solutions. Considerations at this stage could include energy saving or load shifting potential, compatibility with existing systems, technological requirements, and potential constraints or risks;

(b) **financial analysis**: examination of the investment from the perspective of the decision maker; focusing on direct financial costs and benefits, using market prices for valuation, and incorporating transfer payments, such as taxes and subsidies. The applied discount rate reflects the investor's opportunity cost of capital. Internal wider benefits ([7]), such as enhanced workforce productivity following an office building retrofit, may also be considered, although these are often challenging to quantify and monetise for private decision makers;

(c) **economic analysis**: Taking a societal perspective, capturing all economic costs and wider benefits of an energy efficiency solution for the society as a whole; using economic or shadow prices for valuation and exclude transfer payments. The applied discount rate represents societal time preference as regards money and is usually lower than that in financial analysis. This approach considers also external wider benefits, including environmental, health, and other societal impacts that are not captured in a financial analysis ([8]). Importantly, in line with Article 3(5), point (b), of Directive (EU) 2023/1791, the analysis should also take into account the impact on energy poverty. For instance, it could include a dedicated assessment of costs and benefits for vulnerable and low-income households.

The economic analysis is particularly relevant for the decision-making process of public authorities and their role in upholding public interest by considering the wider societal implications of their actions.

Private entities such as businesses and non-governmental organisations normally accompany their decisions with financial analysis, reflecting their own financial interests, unless the additional societal cost would be covered by public funding. External wider benefits (for example, effect to air quality) might be considered, but they often constitute secondary considerations, potentially pursued for reasons such as corporate social responsibility. Therefore, Member States could encourage private entities to consider societal benefits alongside financial considerations in their decision-making processes by offering public support and other measures (see also Section 4.9.).

4.3. Handling of major investment decisions above and below the thresholds set out in Article 3(1) of Directive (EU) 2023/1791

Pursuant to Article 3(4) of Directive (EU) 2023/1791, Member States are to ensure that the competent authorities monitor the application of the EE1st principle. As detailed in Section 5 of these guidelines, part of the competent authorities' remit should include determining whether investments are above or below the thresholds set out in Article 3(1) of Directive (EU) 2023/1791.

As regards major investment decisions above the thresholds (EUR 100 million or EUR 175 million for transport infrastructure projects), Article 3(1) of Directive (EU) 2023/1791 explicitly requires Member States to ensure that energy efficiency solutions are assessed. For more details, see Section 4.2. of these guidelines.

As regards major investment decisions below the thresholds, there is no explicit legal requirement in Directive (EU) 2023/1791 to assess energy efficiency solutions. However, Member States are encouraged to do so whenever those decisions result in significant energy consumption.

4.4. How to ensure proper assessment of wider benefits?

Pursuant to Article 3(5), point (a), of Directive (EU) 2023/1791, Member States are required to promote and make publicly available cost-benefit methodologies that allow proper assessment of the wider benefits of energy efficiency solutions.

Wider benefits could be understood as the social, environmental and economic impacts arising from implementing energy efficiency solutions which are not immediate personal financial gains or losses that appear on an energy bill.

([7]) See Section 4.4.
([8]) See Section 4.4.

As outlined in Tables 4, 5 and 6, examples of social impacts include improved indoor comfort, alleviation of energy poverty, enhanced property values and noise reduction. Environmental benefits involve reductions in greenhouse gases, air and water pollution, waste generation, and lower land requirements, aiding ecosystem preservation. Economic benefits lead to local job creation, increased workforce productivity, enhanced energy security, and stimulation of business innovation and competitiveness. Each benefit underscores the broad significance of energy efficiency measures beyond their direct financial implications.

Assessment of those wider benefits could involve the following steps:

(a) **ensuring sufficient scope**: A balanced assessment requires consideration of all relevant benefits, bearing in mind that such benefits are often spread across various sectors and actors. Ignoring benefits could lead to a partial assessment. For instance, if the enhanced indoor comfort and avoided illnesses and premature deaths resulting from building retrofits are neglected, the positive results of those buildings retrofits are underestimated;

(b) **quantification in physical units**: Impacts should be quantified in physical units, such as tonnes of air pollutants, full-time equivalent jobs, or avoided sick days. This provides a preliminary basis for comparing different investment options;

(c) **monetisation**: The recommended method is to aggregate wider benefits expressed in different physical units. This process is complex as it involves establishing a value for benefits for which there at first sight no market value. As listed in Tables 4, 5 and 6, monetisation techniques could include direct market valuation, willingness to pay for, or willingness to accept approaches. ([9]) Monetisation is inherently controversial due to the ethical complexities involved, such as valuing human life, and should be conducted carefully using robust methods;

(d) **checking for impact overlaps**: Aggregation in monetary terms could lead to overlaps. For example, building retrofits improve indoor comfort. This affects human health and productivity, which ultimately may also affect economic aspects like disposable income or public budget. Allowing for overlaps would be double-counting of the benefits and would result in overestimation of net impacts. To avoid this, a 'multiple impact pathways' mapping approach could be used, tracing all relevant benefits, their interactions, and the endpoints to be monetised ([10]).

To support that assessment process, various tools and methodologies for the quantification of wider benefits have been developed, including the Horizon 2020 supported tools COMBI ([11]), MICAT ([12]), and Odyssee-Mure. ([13]) More detailed information on quantification methods and supporting tools for individual wider benefits can be found in point 3.7.1. of the Annex to Recommendation (EU) 2021/1749. For transport, the 2019 handbook on the external costs of transport (or its future updates) should be used. ([14])

([9]) H. Pollitt, E. Alexandri, P. Boonekamp, U. Chewpreecha, A. de Rose, R. Drost, L. Estourgie, C. Farahani, D. Funcke, S. Markkanen, G. Moret, C. Rodenburg, F. Suerkemper, S. Tensen, P. Theillard, J. Thema, P. Vethman, F. Vondung and M. Voogt, 2016: The Macroeconomic and Other Benefits of Energy Efficiency. Final Report. T. Mandel, L. Kranzl and S. Thomas, 2022: Energy Efficiency First and Multiple Impacts: integrating two concepts for decision-making in the EU energy system, Deliverable D3.4 of the ENEFIRST project. F. Suerkemper, F. Vondung, C. Xia-Bauer, J. Teubler, S. Hackspiel, F. Berger, B. Schlomann, W. Eichhammer, F. Wagner, A. DeVita, Z. Vrontisi and I. Rogulj, 2022: Overall quantification and monetisation concept, Deliverable 2.1 of the MICAT project.

([10]) D. Ürge-Vorsatz, S. T. Herrero, N. K. Dubash and F. Lecocq, 2014: Measuring the Co-Benefits of Climate Change Mitigation, 39 Annual Review of Environment and Resources 549, 2014.

([11]) COMBI: Calculating and Operationalising the Multiple Benefits of Energy Efficiency in Europe, https://combi-project.eu/.

([12]) MICAT: Multiple Impacts Calculation Tool, https://micatool.eu/. The MICATool can be used as a calculator allowing for the use of own data (if available) or otherwise default set values compatible with NECPs and/or EU legislation.

([13]) ODYSSEE-MURE https://www.odyssee-mure.eu/data-tools/multiple-benefits-energy-efficiency.html/.

([14]) European Commission, Directorate-General for Mobility and Transport, Essen, H., Fiorello, D., El Beyrouty, K. et al., Handbook on the external costs of transport – Version 2019 – 1.1, Publications Office, 2020, https://data.europa.eu/doi/10.2832/51388.

In accordance with the EU level CBA methodologies ([15]) provided for in Article 11 of Regulation (EU) 2022/869 of the European Parliament and of the Council ([16]), national regulatory authorities could define appropriate methodologies for conducting CBAs in specific areas. If required, those methodologies could be supplemented with additional guidelines, thereby ensuring robust CBAs that thoroughly assess the wider benefits of energy efficiency solutions.

Table 4

Social wider benefits of energy efficiency solutions

Benefit	Description	Possible quantification and monetisation approaches
Indoor comfort	Improved insulation, heating, and cooling systems could make living and working environments more comfortable and contribute to better health	Survey-based measurements of comfort, potentially monetised through health cost savings (willingness to pay/accept method) or productivity gains (revealed preference method)
Energy poverty	Implementing energy efficiency measures could help alleviate energy poverty by making energy more affordable for low-income households	Savings on energy bills, reflected in disposable income of households (direct market valuation)
Property values	Energy-efficient buildings could have higher market value due to reduced energy costs, compliance with national standards and improved comfort	Change in property values, potentially monetised using real estate market data (hedonic pricing method)
Noise	Energy-efficient building design and insulation could help reduce noise from both external sources and internal systems, improving living and working conditions. Energy efficient (electric and human-powered) land and waterway transport could also reduce noise emissions.	Noise reduction quantified in decibels, monetised using property value impacts (hedonic pricing method) or health cost savings (willingness to pay/accept methods)

Table 5

Environmental wider benefits of energy efficiency solutions

Benefit	Description	Possible quantification and monetisation approaches
Greenhouse gases	Energy efficiency solutions could decrease the demand for energy, which often leads to lower greenhouse gas emissions	Quantified in tonnes of CO_2-equivalent reduced, potentially monetised using carbon pricing (direct market valuation)
Air quality	Reducing energy consumption could help decrease air pollution from power plants and industrial processes, benefiting public health and the environment	Quantified in reductions of pollutants, monetised using health impact costs (damage cost avoided method)

([15]) ENTSOG, 2019: 2nd ENTSOG Methodology for Cost-Benefit Analysis of Gas Infrastructure Projects 2018. ENTSO-E 2018: 2nd ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects, Brussels, 2018.

([16]) Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013 (OJ L 152, 3.6.2022, p. 45, ELI: http://data.europa.eu/eli/reg/2022/869/oj).

Water use	Energy-efficient technologies and practices could help decrease water usage, as water is often required for power generation and energy production processes. This can lead to lower water stress and reduced competition for water resources.	Water savings quantified in volume, potentially monetised using water pricing (direct market valuation)
Waste	Energy efficiency could lead to a reduction in waste generation, as less raw material is required for energy production, and more efficient processes produce less waste and by-products.	Waste reduction quantified in weight/volume, monetised using waste disposal or recycling costs (avoided cost method)
Land use	By reducing the demand for land and resources associated with energy production, energy efficiency could contribute to the protection of ecosystems.	Land savings quantified in area, potentially monetised using land value (direct market valuation) or ecosystem service valuations (willingness to pay method)
Biodiversity	Energy efficiency can lead to reduce biodiversity loss, as less raw materials are required for energy production, including biomass and virgin materials whose extraction can be harmful for nature.	Even if metrics already exist to quantify biodiversity loss, there is no full consensus on the best methodologies. However, the Commission is involved in the development of different useful approaches and data ([1]) that can be used in this context. At the very least, a qualitative assessment of pressures and impacts on nature should be implemented.

([1]) The Commission adopted a Recommendation on the environmental footprint of organisations in December 2021, with references to biodiversity (page 27). Also, the Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU as regards sustainability reporting standards (OJ L, 2023/2772, 22.12.2023, ELI: http://data/europa.eu/eli/reg_del/2023/2772/oj) refers to biodiversity from page 133. Natural Capital and Ecosystem Services Accounts (Ecosystem accounts – measuring the contribution of nature to the economy and human wellbeing – Statistics Explained (europa.eu)) and the work of Mapping and Assessment of Ecosystems and their Services (MAES, https://data.jrc.ec.europa.eu/collection/MAES), as well as the Habitats and Birds Directives provide relevant data and information about ecosystems, their condition and services.

Table 6

Economic wider benefits of energy efficiency solutions

Benefit	Description	Possible quantification and monetisation approaches
Job creation	Investments in energy efficiency could create local jobs in areas such as construction, manufacturing and energy services.	Jobs created, monetised using wage data (direct market valuation)
Workforce productivity	Energy-efficient workplaces could lead to better working conditions, boosting employee productivity and job satisfaction.	Productivity gains quantified using performance metrics, monetised using wage or output data (revealed preference method)
Energy security	Energy efficiency could help reduce a country's dependence on imported energy sources, enhancing national energy security.	Energy savings quantified in energy units, monetised using energy price forecasts (direct market valuation)
Innovation and competitiveness	Investments in energy efficiency could stimulate innovation in technology and business models, helping companies gain a competitive edge in global markets.	Difficult to directly quantify and monetise, but potential indicators include number of patents filed, number of new products launched, or changes in market share

4.5. **How to apply the EE1st principle within and beyond the public sector and regulated sectors?**

The practical application of the EE1st principle depends on the decision-making context and the actors involved. Even though the implementation of the principle embodied in Directive (EU) 2023/1791 is vested in the Member States, the relevant decisions on planning, policy and investment are taken by a large number of actors.

Policy makers (ministries and the supervisory authorities at all levels of government) should take into account the various key responsibilities they have when implementing the EE1st principle:

(a) reviewing existing and planned policies to determine if they are consistent with the EE1st principle, that is to say whether the incentives or regulations create a level playing field for energy efficiency solutions and traditional energy supply infrastructure;

(b) developing energy market regulation that is technology-inclusive, that is to say, values the benefit of energy efficiency and flexibility;

(c) taking into consideration the implementation of the EE1st principle when providing any public investment (including network investment) and public funding/support for market actors. If such an investment constitutes a major investment decision above the thresholds of EUR 100 million or EUR 175 million for transport infrastructure projects, Member States are required to ensure that energy efficiency solutions are assessed, including before granting possible public support;

(d) developing strategic planning of energy policies that fully consider the use of energy efficiency solutions.

The leverage of the Member States on the different actors who can actually implement the EE1st principle in their decisions varies considerably. The basic distinction is between public/regulated actors and market actors (including energy market actors and final energy users who should be considered as part of the 'non-energy sectors'). The scope of leverage and the main tools are summarised in Figure 1.

Publicly owned or regulated entities may be directly requested by national authorities to implement the EE1st principle in their operations if they have to make their planning and major investment decisions based on societal CBA. In addition, the implementation of the EE1st principle by regulated entities, such as network operators means the use of demand-side flexibility and demand response ([17]) whenever it is a cost-effective alternative to traditional network investment and operation and does not negatively affect the reliability and security of the energy system. Network planning and operation could involve the following steps:

(a) identifying supply-demand trends: assessing energy trends (for example, electrification of heat and transport, electrolysers, behind-the-meter generation, etc.) in a location-specific manner and analysing the adequacy of the existing infrastructure to meet consumer expectations; properly factoring in price elasticity of demand and the potential for both explicit (traded and dispatchable) and implicit (price-based) demand flexibility;

(b) assessing demand-side and supply-side solutions: carrying out feasibility studies to determine the technical and economic viability of all options, including demand-side solutions (for example, procurement of flexible load) next to supply-side (for example, installation of new substation), including their respective costs and wider benefits. The mandate of national regulatory authorities usually includes consumer protection and that includes the implementation of the least cost solution enforced to shield consumers from cost that are avoidable;

(c) monitoring and evaluation the performance of both demand-side and supply-side solutions to identify opportunities for improvement.

Network operators are natural monopolies under regulatory oversight. To deliver on this obligation, regulations for network operators could be reformed to incentivise investments into demand-side solutions by eliminating the CAPEX-bias and introducing performance targets with the adjacent financial incentives. In addition, network tariffs could be designed so that payment is primarily linked to consumption, incentivising consumers to use less energy.

([17]) In general, alternatives also known as non-wires alternatives.

Energy market actors (producers, storage owners, suppliers, aggregators etc.) make business decisions, based on their own financial analysis ([18]), without direct regulatory oversight. Energy suppliers, for example, sell energy to customers. They could contribute to the application of the EE1st principle through energy efficiency obligation schemes (EEOS) pursuant to Article 9 of Directive 2023/1791, where they are required to improve the end-use energy efficiency of a customer's facility.

Final energy users (which are to be regarded as part of the 'non-energy sectors') are market actors whose energy related actions can be shaped predominantly via price and tariff signals, and administrative regulations such as product, building or land use regulations. They produce and consume energy (operational decisions) and invest in various energy assets 'behind the meter', including buildings (investment decisions). By adopting energy-saving behaviours, investing in technologies and practices linked to participation in demand response programmes, generating energy from renewable sources and using 'behind the meter' storage (including power-to-grid electric vehicles), they could directly impact the need for supply-side infrastructure 'in front of the meter'. Applying the EE1st principle to final energy users would mean providing them with effective incentives and empowering environment that enables them to adopt technologies and behaviours that reduce energy use and introduce demand flexibility. Such empowering environment includes not only provision of incentives but also behavioural and information instruments.

Figure 1

Leverage ladder for the application of the EE1st principle

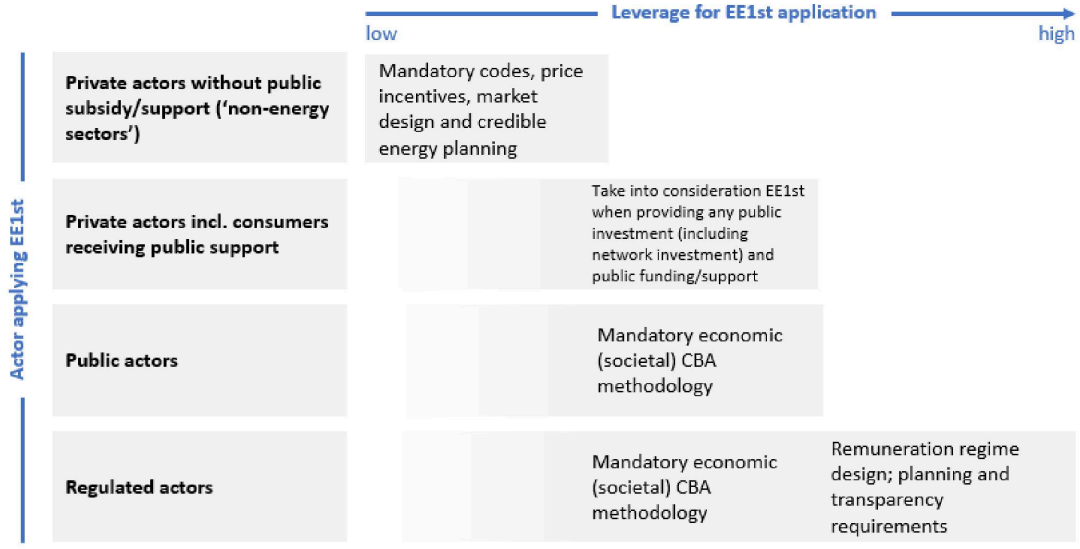

Table 7, which is based on Recommendation (EU) 2021/1749, suggests measures across policy areas to facilitate the EE1st principle's application.

Table 7

Policy areas and examples of measures to enable the application of the energy efficiency first principle in those policy areas

Policy area	Selection of measures
Electricity markets	— Dynamic electricity pricing — Support for installation of smart equipment — Time-differentiated network tariffs

([18]) See Section 4.2.

	— Facilitation for participation of demand response and its aggregators in energy markets — Acceleration of roll-out of smart metering systems — Innovative regulatory incentives for transmission system operators and distribution system operators in network development
Energy supply and distribution	— Development of joint supply-demand scenarios for infrastructure planning — Requirement to use CBA in planning of regional networks of electricity, gas or heat to identify the most cost-effective energy supply and demand options — Integration of heating and cooling in urban, rural or industrial areas planning — Reuse of waste heat and integration of waste heat in district heating networks
Energy demand (industry and services)	— Linking permitting of industrial facilities generating waste to the possibility of connecting to local heat networks — Minimum energy performance standards — Introducing requirements for demand response capacities — Introducing augmented tax depreciation or temporary depreciation rules
Buildings	— Inclusion of building renovations in the auctioning of renewable energy sources — Innovative financing schemes for building renovation, including energy efficiency mortgages — Linking permitting of localization of buildings to renewable energy potential — Using energy performance contracts to ensure guaranteed energy efficiency gains — Installing feedback systems on energy consumption via smart meters and smart devices
Transport	— Incentivising public transport, cycling and walking — Incentivising purchase and use of zero-emission vehicles — Promoting shared mobility which leads to increasing occupancy rates of vehicles — Taking energy efficiency into consideration when designing infrastructure projects
Water	— Linking of electricity and water infrastructure, for example, by pumping water when electricity demand is low — Production of biomethane on site in wastewater treatment — Use of process control techniques across water systems to reduce water cooling volumes for energy production

Information and communications technology	— Encouraging localization of data centres close to heat networks — Setting system energy performance standards — Promoting use of behind-the-meter battery storage for demand response in 5G macro sites — Providing information to consumers on energy consumption variations of streaming options
Financial sector	— Applying full asset life analysis of the energy and carbon footprint of the investment, when assessing a financing decision — Developing EE1st application tools to assist developers and project owners to fully assess the potential opportunities for improved energy efficiency — Evaluation and design of green components for traditional mortgage loans with energy performance assessment

4.6. **How to ensure the application of the EE1st principle in major private investment decisions?**

Member States are required to ensure the assessment of energy efficiency solutions in major investment decisions ([19]). When the investment project in question is under public ownership the responsible authorities, based on the analysis could take a decision that would alter or downscale the project to maximise the social benefit.

For investments under private ownership, taking an alternative course of action might not be possible or in the interest of the private owner. For example, where a power plant operator intends to build a new gas power plant valued above EUR 100 million, national authorities could require an economic (social) CBA before the plant construction. Even if that CBA reveals that energy efficiency solutions, such as demand-side flexibility, are economically more cost-effective than the power plant, the plant operator would have no financial incentive to stall its own investment and to forego potential profits, since its primary business concern is energy generation, not savings.

Therefore, rather than imposing the EE1st principle through mandatory assessments, private major investment decisions should be driven by dedicated policy incentives to encourage the adoption of cost-effective energy efficiency solutions. Carbon pricing provided for in Directive (EU) 2003/87/EC will reduce the financial return of such investments, while also enforcing non-discriminatory market access for demand-side flexibility in energy, balancing and capacity markets and deploying time-differentiated electricity pricing as in accordance with Regulation (EU) 2019/943 of the European Parliament and of the Council ([20]) will increase the financial return for the alternatives based on demand side flexibility. In addition, credible energy or sectoral planning, such as national energy and climate plans or national transport planning, could provide private decision-makers with information on foreseeable policy frameworks and market conditions.

4.7. **How to address the impact on energy poverty?**

As defined in Article 2, point (52), of Directive (EU) 2023/1791, energy poverty means ‘a household’s lack of access to essential energy services, where such services provide basic levels and decent standards of living and health […], caused by a combination of factors, including at least non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes.’

Recital (23) of the preamble to Directive (EU) 2023/1791 highlights that individuals at risk of energy poverty or residing in social housing should benefit from the application of the EE1st principle. In particular, by promoting ‘cost-efficient energy efficiency measures’ as referred to in Article 2, point (18), of Regulation (EU) 2018/1999, the EE1st principle inherently aims to reduce costs and increase benefits for consumers, including those impacted by energy poverty. This approach directly addresses structural issues, such as inefficient homes, that contribute to energy poverty.

([19]) See section 4.2.

([20]) Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (OJ L 158, 14.6.2019, p. 54, ELI: http://data.europa.eu/eli/reg/2019/943/oj).

Pursuant to Article 24(1) of Directive (EU) 2023/1791, Member States are required to empower and safeguard individuals affected by energy poverty. Suitable measures could include:

(a) promoting energy efficiency solutions;

(b) prioritising public funding for vulnerable beneficiaries;

(c) providing comprehensive technical assistance and information;

(d) deploying funding and financial tools to help vulnerable groups capitalise on energy efficiency investments.

4.8. **What institutions could act as monitoring entities?**

The 'entity' referred to in Article 3(5), point (c) of Directive (EU) 2023/1791 could for example, be either a public entity (national regulatory authority, the energy ministry, a government agency) or an independent third-party actor with a specific and explicit mandate from the State to execute this task. It would be important that the entity has the required cross-cutting institutional mandate for coordinating all 'relevant entities' as referred to in Article 3 of that Directive and in Recommendation (EU) 2021/1749. Monitoring should not be limited to the new policy decisions or investments but include the assessment of the status quo with regard to all relevant policies and regulations. Even though the choice is likely to be country specific, depending on the existing institutions and their tasks, some general considerations are provided in Table 8:

Table 8

Relevant institutions for Article 3(4)

Institution	Pros
National regulatory authority/ energy agency	Energy (all fuels) and regulation focused; often tasked with the implementation of energy efficiency policies such as EEOs; experience in data collection and monitoring
Ministry (of energy)	Direct impact of policies on both energy supply and demand; established coordination mechanisms with other sectoral ministries on certain final energy users (non-energy sectors)
Independent body	No conflict of interest, available human capacities, cross-sectoral experience

4.9. **How to promote the application of cost-benefit methodologies?**

Article 3(5), point (a), of Directive (EU) 2023/1791 requires Member States to promote cost-benefit methodologies that allow proper assessment of the wider benefits of energy efficiency. Potential promotion initiatives could include:

(a) **developing comprehensive guidelines:** Member States could establish guidelines for conducting CBAs that require the inclusion of wider benefits and a societal perspective, referring to the Commission guidelines referred to in Article 3(6) of Directive (EU) 2023/1791;

(b) **training and capacity building**: Member States could organise training programmes and workshops to equip decision makers, such as public authorities and network operators with knowledge and tools for CBAs in line with the EE1st principle;

(c) **including CBA in regulatory frameworks**: legislation and policy directives could require the use of CBA in decision-making processes, particularly in areas related to energy systems;

(d) **establishing independent oversight bodies**: those bodies could review CBAs to ensure that they have been conducted properly and that they comply with the EE1st principle.

5. REPORTING REQUIREMENTS UNDER THE APPLICABLE LEGAL FRAMEWORK

5.1. Update of the integrated National Energy and Climate Plans

Pursuant to Article 3(3), point (b), of Regulation (EU) 2018/1999, Member States are to take into account the interlinkages between the five dimensions of the Energy Union, in particular the EE1st principle in their national energy and climate plans (NECP).

5.2. Progress Reporting

Pursuant to Article 3(4) of Directive (EU) 2023/1791, competent authorities ([21]) should monitor the application of the EE1st principle, where policy, planning and investment decisions are subject to approval and monitoring requirements.

The data framework for monitoring the EE1st principle could build on existing monitoring processes and related data sources that fall within the scope of Directive (EU) 2023/1791 Directive 2010/31/EU of the European Parliament and of the Council ([22]), Directive (EU) 2019/944 and Regulation (EU) 2019/943.

In particular, Article 3(5), point (d), of Directive (EU) 2023/1791 requires Member States to report on the application of the EE1st principle in their integrated national energy and climate progress reports submitted pursuant to Regulation (EU) 2018/1999. This reporting should include at least two aspects.

First, the progress reports should include an assessment of the application and benefits of the EE1st principle. For that purpose, Member States may use the monitoring indicators provided for in Commission Implementing Regulation (EU) 2022/2299 ([23]). Examples of monitoring indicators relevant for EE1st monitoring may be found in the Annexes to Implementing Regulation (EU) 2022/2299 and include:

(a) national contribution and indicative trajectory for primary and final energy consumption (Annex IV, Table 1);

(b) progress towards national objectives relating to consumer participation in the energy system (Annex VI, Table 6);

(c) available projected and realised costs and benefits of individual or groups of policies and measures on energy efficiency (Annex IX, Table 5);

(d) reporting on indicators in relation to energy poverty (Annex XIX, Table 2).

Second, the progress reports should include a list of measures taken to remove barriers to the implementation of the EE1st principle, including in national legislation. Section 4 of the Annex to Recommendation (EU) 2021/1749 provides a detailed overview of measures to apply the EE1st principle in specific sectors and policy areas, a non-exhaustive list of which is provided in Table 7 of this Annex.

([21]) See Section 4.8.

([22]) Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13, ELI: http://data.europa.eu/eli/dir/2010/31/oj).

([23]) Commission Implementing Regulation (EU) 2022/2299 of 15 November 2022 laying down rules for the application of Regulation (EU) 2018/1999 of the European Parliament and of the Council as regards the structure, format, technical details and process for the integrated national energy and climate progress reports (OJ L 306, 25.11.2022, p. 1, ELI: http://data.europa.eu/eli/reg_impl/2022/2299/oj).