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The Energy Efficiency First Principle and the Role of Evaluation

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EXTENDED ABSTRACT

In this extended abstract, we explore the role of evaluation in the application of the Energy Efficiency First principle (EE1st principle) that has been defined by recent European Union (EU) legislation.

Introduction and background

The EE1st principle was defined in the 2018 EU Governance Regulation[1], and the 2023 recast of the Energy Efficiency Directive (EED)[2] holds further concrete requirements to Member States in its articles 3 and 27.

The official EU definition (article 2 (18) of the governance regulation) reads: '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'.

"Taking utmost account … of alternative cost-efficient … measures" clearly implies the use of evaluation methods. Here, we will explore the role of evaluation in application of the EE1st principle, i.e. which purposes or objectives evaluation needs to pursuit. This will determine, which kinds of methods may be needed. Due to space constraints, we can only go in detail here and there. In general, the methods appropriate for the purposes or objectives will be those usually applied in other contexts. Similarly, the definition and implementation of the EE1st principle itself could be a subject of evaluation, as any policy instrument. But this is not in the scope of this extended abstract that is focused on how evaluation can contribute to the implementation of the EE1st principle.

Methodology

As this is an exploratory exercise, the only methods used were rational thinking and literature review. It is important to note that the EE1st principle bears significant similarity to the principles of Integrated Resource Planning or Least-Cost Planning developed in the USA and other regions in the 1980ies. A major difference, however, is that the EE1st principle covers not only planning and investment decisions, but also policy decisions. In addition, if covers all forms of energy and all energy end-use sectors.

[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

[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 (recast)

Results

In our exploratory exercise, we find that evaluation has three key roles for implementing the principle.

The first and most important role is in the *assessment of the cost efficiency and reliability of alternative energy efficiency measures*. The measures will depend on the type of decision, such as policy (e.g., the National Energy and Climate Plans that the EU Member States have to develop, building energy regulations, or the creation of a capacity market), planning (e.g., the Ten-Year Network Development Plans for expansion of transmission networks), or investment, such as for a concrete transmission line, a pipeline, or a motorway. Therefore, the relevant energy efficiency measures could be programmes or single investments to reduce energy consumption through energy efficiency, e.g., in buildings, appliances, industry, transport, including energy-efficient electrification, or even water supply and wastewater treatment. In addition, they could also aim to improve the mutual adaptation of the supply and demand of energy, particularly electricity, through demand-side response, demand-side or supply-side storage, or other measures. Hence, this type of evaluation will be *an ex-ante impact/summative evaluation* of 1) *potential energy savings and/or changes in load profiles*, and 2) the *benefits and costs* of the energy efficiency measures, including their wider benefits (multiple impacts[3]), as required by legislation. Particularly for the impacts on load profiles, this may require complex energy and demand system modelling.

The EE1st principle means to prefer the energy efficiency measures over the expansion of energy supply and the corresponding infrastructures, if the benefits are higher than the costs of the energy efficiency measures. It also means treating such energy efficiency measures as a resource for ‘still achieving the objectives of those decisions’. They must provide the energy services, such as keeping buildings warm or cool, production of goods, matching power supply and demand, or water supply, with the same reliability as expected from an enhancement in energy supply/infrastructures. Therefore, a *reliable* prediction of the achievable impacts of energy efficiency measures will be needed. This will require a better quality of evaluated evidence from previous, similar measures or pilot projects than energy- or climate policy-makers in the EU have often requested so far.

The second role of evaluation is in the assessment of whether the alternative measures are delivering in practice as it was expected. This will be *both a process/formative and an ex-post impact/summative evaluation*. This will probably not differ much from usual process and ex-post impact evaluations of EE measures, except for the case that the default infrastructure option to be replaced or deferred is an upgrade of the grid. In that case, the local/regional impact on peak load deserves special attention in the evaluation (i.e. not only how much, but also when and where energy is saved). The results of these process and ex-post evaluations can be used to improve measures during their implementation, and as a source of evidence for future ex-ante analysis in applications of the EE1st principle, under the first role of evaluation discussed above.

The third role is in the evaluation of policy design and whether a policy might create or mitigate bias against energy efficiency in investment decisions, considering that policies should address possible misalignments between individual investor’s and society’s perspectives. Therefore, this requires drawing up a policy theory of potential impacts of a policy to detect potential implicit or explicit biases, and an evaluation of the benefits and costs from both the individual investor’s and society’s perspectives[4].

[3] For example, https://micatool.eu/seed-micat-project-en/index.php presents both information on what these wider benefits can be, and offers a tool for calculating them for concrete measures.

[4] California Public Utilities Commission (CPUC) (2001) California Standard Practice Manual (CSPM): Economic Analysis of Demand-Side Management Programs and Projects.; Wuppertal Institute et al. (2009). Measuring and reporting energy savings for the Energy Services Directive – how it can be done, cited in: European Commission (2021). 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.

Conclusion & discussions

Although EU legislation only requires Member States to assess whether energy efficiency measures could be cost-efficient alternatives to energy supply, the EE1st principle may lead to a greater attention for energy efficiency in the practice of energy planning, policy and investment decisions. We find that its application requires three key roles for energy evaluation: 1) assessment of the cost efficiency and reliability of alternative energy efficiency measures; 2) the assessment of whether the alternative measures are delivering in practice as it was expected; 3) evaluation of policy design and whether a policy might create or mitigate bias against energy efficiency in investment decisions.

Current practice of evaluations of energy efficiency measures in the EU usually focuses on energy savings and the corresponding greenhouse gas emissions reductions in relation to policy targets, but not always on cost-effectiveness, particularly from the societal perspective. Compared to this, application of the EE1st principle will put greater emphasis on costs and benefits, including wider benefits (multiple impacts) and both the individual investor's and society's perspectives through roles number 1) and 3), as well as on the reliability of achieving energy savings and/or changes in load profiles through implementing energy efficiency measures, in roles number 1) and 2).

Obviously, evaluations under the EE1st principle should also follow good evaluation practice in general. This will certainly include a careful choice of the concrete evaluation objectives and methods. It may also include the use of the OECD-DAC criteria to address, e.g., whether the measures considered are relevant to the objectives of the policy, planning, or investment decisions and coherent with other energy policy or planning measures. Assessing the impact, effectiveness, and efficiency as well as the sustainability of the impacts is integral to assessments under the principle anyway, under roles 1) and 2). Long-term goals like decarbonization, social equity, and resilience can be covered by the analysis of the wider benefits, in assessing whether the measures still achieve the objectives of the policy, planning, or investment decisions.