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The politics of measurement and the case of energy efficiency policy in the European Union

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ABSTRACT

Energy efficiency is a policy strategy to make energy savings and reduce greenhouse gas emissions in Europe. This paper investigates the passage of amendments to the Energy Efficiency Directive during 2016–2018 as a case study. It focuses on an incident, in which the rapporteur in charge of the energy efficiency file in the European Parliament proposed to re-think the way energy efficiency is defined and measured thus initiating a struggle over the meaning of energy efficiency itself. Drawing on insights from the field of Science and Technology Studies (STS) and work on indicator politics, this paper explores how the meaning of energy efficiency was negotiated through the way it is measured. These political negotiations are used as a case to empirically explore politics of measurement, i.e. practices and procedures through which the conceptualization and measurement of energy efficiency get entwined, and in which a seemingly "technical" discussion weaves together scientific and methodological aspects with political, societal and environmental issues. In this way, the work presented here explores how processes of politicization and depoliticization in the formulation of energy efficiency indicators contribute to bringing about the very governance object that is energy efficiency.

1. Introduction

Energy efficiency is a major part of EU energy policy, seen as a key ingredient to reduce energy consumption and greenhouse gas emissions in Europe [1]. Between 2016 and 2018, a process took place to amend the Energy Efficiency Directive 2012/27/EU (EED). The EED sets the rules and obligations for the EU's 2020 and 2030 energy efficiency headline targets. Before the file reached the European Parliament (EP), there was an expectation that the political debates were likely to focus more on the level of the targets, i.e., the 'ambition' in percentage terms, rather than the methodologies used to calculate the headline target indicators. In an unusual move, however, the rapporteur in charge of the energy efficiency file in the EP proposed an overhaul in the way that energy efficiency was defined and measured. The action led to a struggle over the meaning of energy efficiency itself – including the way it is measured, described, conceptualized and applied in practice. In doing so, it opened a space up where indicators and measurement temporarily became an object of debate. Different versions of energy efficiency were brought forward by different actors. These include an understanding of energy efficiency as a ratio between either primary and final energy or economic growth and energy consumption (i.e., energy intensity), or energy savings and overall lower energy consumption. This conceptual ambiguity is a problem that has been highlighted in both the scientific literature and the policy arena – especially the interchangeability between energy savings and energy efficiency. Various scholars [2–4] have sought to clarify the definition of energy efficiency to avoid this ambiguity, explaining that different ways of conceptualizing and calculating energy efficiency indicators have different implications for the effectiveness and outcomes in policy.

This moment in the amendment process is a fascinating case for observing the interplay of political actors, their conceptualizations of energy efficiency, and the processes through which they sought to reach a compromise on issues of energy policy through debating the seemingly technical issue of how to measure energy efficiency. Using insights from Science and Technology Studies (STS) we show that ostensibly "technical" and apolitical scientific objects such as energy efficiency definitions and indicators are in fact spaces where the negotiation of interests and the different visions and valuations of what is regarded important for future energy consumption are enacted. Or, in other words, this is an example of the temporary opening-up of a "governable space which lent

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itself to political intervention" ([5] pp.125) and struggles for "calculative power" [6].

In doing so, this article aims to contribute to the energy efficiency literature by bringing together work at the nexus between the social sciences literature and the natural and engineering sciences that dominate the field of energy efficiency. As Dunlop [7] argues, such interdisciplinary work is needed to better understand sociological issues embedded in quantitative representations such as energy efficiency definitions and indicators.

2. The challenges of implementing the energy efficiency concept in policy

Conceptual ambiguity and methodological challenges affect the design and implementation of energy efficiency policy in practice. For example, authors have highlighted the confusion in the academic, policy and grey literature among energy efficiency and other related terms, including energy conservation [8] energy demand [9] and energy savings [3]. A distinction is often made between energy efficiency and energy conservation, as these terms are used interchangeably. If energy efficiency is reducing energy input while keeping energy services constant, energy conservation is thought of as reducing energy input by reducing energy services [10].[1]

Given the conceptual ambiguity in the energy efficiency literature, calls for more precise definitions of concepts such as energy efficiency are quite common. Clearer definitions, so the argument goes, can improve the field's understanding of what is at stake and what the trade-offs are for any given indicator. Authors have sought to explain what energy efficiency is and why the implementation of the concept of energy efficiency is so problematic in practice [2,3]. Energy efficiency is generally conceptualized as a ratio of energy input (e.g. kwH of electricity) to the output of useful energy services (e.g., light or heating). An 'improvement' in energy efficiency thus implies that one is using less energy for the same level of service or output, resulting in "energy savings". This method, however, does not necessarily imply an overall reduction in energy consumption, just that one is using energy at a more efficient rate, due, especially, to technical change and innovation [11,12] or consumer behavioral change [13]. Energy efficiency is therefore a ratio, not a quantity. For example, a clothes dryer that is labelled energy efficient may use a more efficient work rate of energy input to energy service output (i.e., clothes drying). However, if the user decides to use the dryer on a more frequent basis, it may consume a higher overall level of energy. This problem relates directly to one particular challenge that has been discussed for decades in the energy efficiency literature: the "rebound effect".[2] The rebound effect can be defined as a mechanism whereby expected savings through energy efficiency actions are reduced [14]. This means that we may be making less savings from energy efficiency actions than we thought. Our current understanding of the rebound effect entails a degree of uncertainty given a lack of consensus on the nature and extent of the phenomena and difficulties in accurately measuring it.[3]

Another major problem highlighted in the literature is that energy efficiency is framed too narrowly and, therefore, leaves out variables that are important to energy conversion processes. Among these are e.g., energy qualities and their compositions, environmental sustainability, pollution displacement and the durability of materials and power [2,15]. There is a lively debate on these issues in the social sciences and humanities (SSH) field that suggests that the concept itself is problematic, as it contributes to perpetuating the problems that it is meant to solve. The argument goes that, by focusing on relative rather than absolute levels of consumption, energy efficiency supports the continuation of high levels of energy services and comfort rather than encouraging change in energy production and consumption systems or more sustainable energy-use practices [16,17].

Many of the methodological and theoretical challenges and alternatives outlined above, however, are rarely cited or publicly acknowledged in EU energy efficiency policy. Much of the literature on energy efficiency policy is focused on improving policy design and reducing "barriers to energy efficiency improvements" [18], rather than examining methodological limitations of the concept itself, and how these are manifest in quantitative representations such as indicators.[4]

A shortcoming identified by scholars in the energy literature is that it is dominated by a techno-economic energy imaginary which impedes efforts to find solutions that can properly address sociological energy consumption problems. Genus et al. [19], for example, point to the need for a more situated approach that puts emphasis on social practices relevant to energy use, interdisciplinarity and the coproduction of knowledge with diverse actors. Similarly, Nikas et al. [20] argue that there should be a more holistic and transdisciplinary perspective on the role of human choices and behaviors in influencing the low-carbon transition in energy research, including how the desires of individuals and communities interact with the energy and economic landscape and lead to systemic change at the macro-level. The issue of energy transitions is furthermore brought together with questions of distributive justice by von Platten et al. [21], who argue that the choice of energy performance metrics influence which buildings are considered energy efficient and call for open discussion on these metrics. In a similar manner Park et al. [22] call for open debate and improvement of performance metrics.

There is also a growing body of empirical work that utilize social sciences concepts to better understand how discussions on energy efficiency indicators shape policy. Applying discourse analysis to historical energy efficiency policy, Dunlop [23] found that certain values are reflected in how energy efficiency is defined and measured over time and how some potentially relevant concepts and issues get sidelined in favor of others. Niskanen and Rohracher [6] show that while the definition of energy targets, standards and calculation tools are largely presented as a technocratic and expert-driven process, they are actually highly political discussions involving different visions and valuations of various lobby groups which fight for "calculative power" to shape calculation procedures and housing codes regarding energy use.

This paper aims to contribute to this growing strand of research that combines a study of the methodological challenges of energy efficiency implementation with political dynamics to ask questions about what is quantified, what is left out and what issues co-emerge with the ways that energy efficiency is discussed as a quantifiable and governable object. In particular, we look at a case in which a space of negotiation was opened up through the initiative of one EP rapporteur and subsequently closed down again through processes of depoliticization. To do so we draw inspiration from STS concepts that sensitize us to the practices and processes though which certain versions of energy efficiency are defined, constructed, maintained, and shaped, and what impact these visions have on social arrangements, social structures, and the co-production of social and technical orders.

3. Conceptualizing energy efficiency measurement

We draw on research on the politics of measurement by exploring the indicator politics at play in discussions over energy efficiency

[1] For example, turning lights off and heating down is sometimes viewed as an "energy efficiency measure", however it could also be technically classified as "energy conservation" or "reducing energy demand".

[2] A related, but distinct, term is known as the "Jevon's Paradox".

[3] For more on the rebound effect see for example [3]

[4] For example, research on energy efficiency policy has focused on the level of energy efficiency targets [46], National Energy Efficiency Action Plans (NEEAPS) [47] and energy efficiency governance, which examines predominantly institutional and organizational considerations in efficiency policy [48].

legislation, together with the technical and methodological aspects highlighted in the energy efficiency literature. The basic assumption is that indicators are necessarily political as they involve decisions that go beyond the technical level [24,25]. As Merry [27,pp.21] puts it: "The technical is always political because there is always interpretation and judgement in systems of classification, in the choice of things to measure." Furthermore, the development of indicators is not merely about the neutral measurement of a pre-existing object "out there", but rather involves the production of an legible and governable object [26]. The way in which an entity such as energy efficiency is quantified and measured is not self-evident, but is often a matter of political interests as well as practical considerations such as data availability, methodological preferences and skills. Turnhout et al. [25] show how a governance logic espousing neoliberal ideals of transparency, effectiveness, and efficiency – or "measurementality" - creates a particular understanding of ecosystems that may lead to an impoverished understanding of biodiversity. In a similar manner, Asdal [5] - in her work on the European "critical load project" that aimed at quantifying how much pollution is still acceptable - asks how a new 'Nature-whole' is enacted through quantification and how it becomes consequential in politics. This argument points not only to the performative features of method and measurement, but also highlights the importance of political work and "the little tools of governance" [27], that are the "mundane epistemic and administrative tools and practices" aimed at "producing controlled, objective and non-politicized situations and objects." (ibid. pp. 16). Such "little tools" can be certain reports, graphs, or visualizations that are used and become influential in the machinations of bureaucracies. Focusing on them means to trace how they are created and revised, how they travel and how they are used by different actors. However, also the latter part of the quote above is crucial to keep in mind for our work: the default mode of bureaucracies is to create non-political objects and situations and thus a "politics of no politics" [27,28]. The case presented in the empirical part of the section provides an example of an actor who attempts of open up a space where indicators for the measurement of energy efficiency could be debated and contested.

We draw inspiration from these analytical concepts taken from STS to zoom in on the practices through which different objects of governance are enacted [5,29,30]. The starting point for this inquiry is the assumption that such objects are not simply "out there", but rather the outcome of these practices. Procedures and methodologies of quantification and measurement play an important role. Understanding the debates surrounding the initiative of rapporteur Gierek through this lens allows us to zoom in on how the technical gets woven together with political and organizational orderings as well as with implicit normative assumptions about the common good and desirable futures. Energy efficiency as an object that is measured and governed is thus the temporally stabilized outcome of this ongoing debate, not its starting point. In this paper, we dismantle a controversy in the EP that went beyond the usual topics – level of ambition of targets – and focused instead on the ways energy efficiency should be measured (and consequentially also defined). We use this case to explore how debates about the way energy efficiency is measured contribute to bringing about the legible and governable object that is energy efficiency. In doing so, we aim to carve out an understanding of how a certain version of energy efficiency was stabilized through establishing a particular assemblage of the technical-methodological with the social, organizational, legal, and normative.

Building on this conceptual framing, we ask how the concrete political procedures and work with and through policy documents contribute to establishing and stabilizing a certain version of energy efficiency as a governable and legible policy-object. By addressing this question, we aim to contribute to the debate on energy efficiency quantification with an empirical perspective that shows how certain procedures mechanisms of EU policymaking become instrumental in depoliticizing indicators and thus stabilizing a particular version of energy efficiency.

4. Methods

This paper applies a case study approach combining document analysis with expert interviews. Data were collected from three sources. Firstly, legislative documents relating to the Energy Efficiency Directive (2012/27/EU) were identified and collated using a saturation approach [31], from June 2016 to December 2018. These included the European Commission ('Commission') impact assessments, parliamentary reports, public debate transcripts and working documents relating to the EED. Following a literature review, 50 documents were initially selected to identify major themes. These were pared down to a total of 20 using a list of codes that were identified through a literature review. A thematic analysis was applied to the 20 documents [32]. This analysis was guided by the analytical framework, the themes identified in the literature review and the first round of analysis [33].

Secondly, as a supplement to this document analysis, twenty-one semi-structured expert interviews were conducted with policymakers, policy officers and independent academics to validate and deepen the results. Interviewees include parliamentarians and/or their assistants who worked directly on the EED file from the Socialists and Democrats (S&D), European People's Party (EPP) and Alliance of Liberals and Democrats for Europe (ALDE) parties. Two representatives from the Commission were interviewed. From this initial sample, policy analysts, academics and energy efficiency specialists who had experience and knowledge of the file were identified through a sampling technique. The interviews lasted 60 min on average. They were designed to gauge the reasoning and rationales on which certain decisions were based, and to elicit the lines of argument used to support these decisions. In particular, these conversations focused on the methodological approaches to the measurement of the headline energy efficiency target and how and why energy efficiency was defined in certain ways. These interviews were intended to do two things: first, to better understand the methodologies of measurement and indicators, including the effects of measuring energy efficiency in different ways and the trade-offs involved; and second, explore that rationales and lines of argument used in these expert accounts [34]. The interviews were used as a base from which to explore relevant topics and provide context for the main themes found in the primary data sources.

Finally, in addition to this core material, 60 news items directly relating to the energy efficiency policy-file were collected from news websites (*Euractiv, Political Pro*) during 2016–2018. The news stories complemented the institutional texts with additional themes, context and timelines. The articles underwent an initial scan to crosscheck key dates and details of the file. Then, using themes identified in the texts and literature review, the articles were used to triangulate information and provide additional context where necessary.[5]

5. Politicizing the way energy efficiency is defined and measured

In November 2016, the Commission presented a proposal to revise the 2012 EED as part of the 'Clean Energy for all Europeans' package. According to the Commission, the EED was amended to meet EU climate

[5] A limitation of our research relates to the actual size and complexity of the energy efficiency policy-file. Focusing on documents and supplemental interviews meant that it was impossible to equally integrate all perspectives and arguments into our account. The selection of documents and interviewees followed the logic of one particular case as it unfolded and focuses on main arguments and turning points. In addition, while we focused on how the "little tools" of policymaking become crucial in this case, future research is needed that delves deeper into the actual methods of calculation and the implications of the choices made there. And finally, a broader perspective and a research design centred more around interviews and focus group discussions might yield important insights into the struggles for "calculative power".

and energy targets for 2030 and align it with other aspects of the Clean Energy package, including renewable energy and carbon emissions. Following the EU's Ordinary Legislative Procedure (OLP),[6] in 2016 the Commission presented its proposal for amendments together with an impact assessment that were then debated by Energy Ministers in the Council of the European Union ('the Council'). Once a proposal reaches the EP, its role is to form consensus among parliamentarians and present proposals as a plenary resolution to the Council for negotiation/agreement. The EP's Committee on Industry, Research and Energy (ITRE) was responsible for managing the energy efficiency directive, including writing the parliamentary report and managing the interinstitutional negotiations. The ITRE energy efficiency file was led by a Polish rapporteur from the S&D group, Adam Gierek, who also represented the Polish Democratic Left Alliance-Labour Union (Unia Pracy) Party. Prior to his parliamentary term, Gierek was an engineering professor of smelting and material science. He had been on the ITRE committee since 2004 and had experience in parliamentary energy matters. Gierek's expectation was that he would follow his Party's line to support a 40 % energy efficiency target by 2030. This was an ambitious stance compared to Commission (30 %) and Council (30 %) proposals. As the rapporteur, he was tasked with securing the highest possible target as an outcome of the trilogue negotiations, which are interinstitutional negotiations to form a consensus on legislation between the Commission, Council and EP.

The ITRE draft report [35] presented to the EP in May 2017 was unusual in that it proposed to overhaul the directive, seeking to detail and explain problems with the calculation of current indicators and offer alternative solutions. In doing so, the ITRE report created a version of energy efficiency that was distinct from that of the Commission. Specifically, it proposed to calculate energy efficiency through the indicator of cumulative primary energy consumption, rather than the separate primary and final energy consumption indicators that the Commission had proposed, and that the directive originally stipulated in 2012. The argument for this change was that the current indicators did not measure energy efficiency comprehensively enough across the economy – i.e., that parts of industry were omitted from measurement but needed to be measured to make them more efficient. These gaps, the report maintained, were notably the energy conversion processes between the primary and final energy stages, "precisely where the links in the energy flow chain that have huge efficiency increase potential and reserves" [35].

The proposed methodology therefore included what it saw as the overlooked parts of the energy chain, including primary energy production and conversion (extraction and transportation of raw materials prior to processing into electricity and/or heat). This would be added to the sectors already included in measures such as the electricity, housing and consumption sectors.[7] Thus, ITRE's enactment of energy efficiency focused more on production, rather than consumption systems. The ITRE report maintained that the aim was to put more onus on energy producers, generators and distributors to make energy efficiency improvements, rather than concentrating the burden on energy consumers at the end of the chain, as the Commission had proposed. The ITRE report had argued that this "would not put enough responsibility on energy providers to modernize their energy production systems with a mind to deliver energy that is efficient in conversion and transfer efficiency" [35].

Energy poverty was a central theme in the parliamentary discussions. The ITRE report argued that focusing on the upstream energy processes would take the burden off consumers at the final stage to make energy savings, thus helping to alleviate energy poverty. Here, a certain political geography was enacted by pointing to the division of political landscapes between rich and poor and "Eastern" and "Western" Member States. In Gierek's native Poland, there was reportedly "little patience with expensive energy efficiency solutions that will hurt poorer people"[8] – i.e., energy efficiency improvements at the consumer end. Gierek believed that obliging consumers in poorer countries to reduce their energy consumption was unfair because "people in poorer countries like Poland and Romania use half the energy of Germans or the French and a third of what Swedes consume".[9]

In contrast, the Commission's argument was that a focus on end-use consumption was precisely the key to reduce energy poverty. Its proposal included targets for energy consumption reduction and energy savings in end-use sectors, (known as Article 7). The rationale for targeting the end-use consumer sector was that by reducing energy consumption, consumers would save money in energy bills: "High energy bills and energy poverty are a major problem in many Member States. In particular, 11% of European citizen cannot keep their houses warm in the winter. Also, companies suffer from high energy bills due to competitive disadvantages, in particular energy intensive industries (large and small) but also those in the service sector. Therefore, energy efficiency policies should in particular target end consumer sectors to improve their situation." [40,pp. 73].[10]

5.1. Reaction to the ITRE report

The report caused upset in Parliament following its release, with MEPs submitting some 600 amendments.[11] *Politico* reported that the message from S&D parliamentarians was confusion over the report. Many were having difficulty understanding it, describing it as "very academic". "Frankly speaking, politicians don't understand technicalities," Gierek responded.[12] He went on to explain that he was

[6] The Ordinary Legislative Procedure is the standard decision-making process in the EU. In the system, the directly elected EP has to approve EU legislation together with the Council (the governments of the 27 EU countries). The procedure starts with a legislative proposal from the Commission. Before its proposal, the Commission prepares impact assessments that assess the potential economic, social and environmental consequences of possible policy options. The Commission formulates a proposal and addresses it to the EP first, which can adopt, reject or amend the proposition. A Member of the EP, working in one of the parliamentary committees, draws up a report on a proposal for a 'legislative text' presented by the Commission. The parliamentary committee votes on this report and, possibly, amends it. When the text has been revised and adopted in plenary, Parliament has adopted its position. Then, the EP's opinion is transmitted to the Council that can reject/accept or put forward its own modifications. Once the text is agreed upon, the two co-legislators adopt legislation jointly, having equal rights and obligations. Agreements between the co-legislators are often reached through tripartite interinstitutional negotiations ('trilogues') between the EP, Council and the Commission.

[7] The report argues that "Using only primary energy would pave the way for a better focus on the entire energy supply chain, including upstream processes (extraction and transportation of raw materials prior to processing into electricity and/or heat). It would also take full account of all final consumers' savings through the use of primary energy factors."

[8] News item: "Polish MEP's quixotic quest to upend the energy efficiency debate," Politico Pro Morning Energy and Climate, 5th December 2017.

[9] News item: Morning Energy and Climate," Politico Pro, 27th September 2017.

[10] In addition to the headline indicator, the ITRE report also proposed that methodologies capture pollution displacement (e.g. through lifecycle analysis) and new, more precise formulas for calculating the Primary Energy Factor (PEF), which captures the rate at which energy conversions are calculated.

[11] News item: "Morning Energy and Environment," *Politico Pro*, 5th September 2017.

[12] News item: "Morning Energy and Climate," Politico Pro, 27th September 2017.

approaching the file from a technical, not political, point of view, *Politico* further reported. One expert interviewee said "his ideas didn't cut through the political discussion at all". The move that caused the greatest rift within his Party, however, was that Gierek, in an unusual move, had not followed his S&D group's line in support of a 40 % headline target. Instead, he supported 35 % in his report, claiming that, as the rapporteur, he could achieve wider support "for a more realistic target" (i.e., one that is easier to negotiate with the EP and EU institutions). Gierek clarified that he would not rule out supporting the 40 % energy efficiency target on the condition that all three stages of the energy flow (i.e., those according to his proposed methodology) were included [35]. Applying his measure across the whole energy chain with a 35 % target, he argued, would be more effective in improving energy efficiency than by using the current methodology with a 40 % target.

This point, however, was lost amid the debates that centered on the numbers. The cost-benefit analysis in the Commission's 2016 impact assessment [36] was central to discussions. The analysis considered different headline indicator options, including 30 %, 35 % and 40 %, considering the cost, social and environmental benefits of each. The conservative parties (European People's Party (EPP) and European Conservatives and Reformists (ECR)) tended to support the lower target of 30 %, claiming that a higher target was too expensive. Gierek argued that a 35 % target was the optimal level because the impact assessment showed that "the closer we get to 40%, the more costs rise significantly" [35]. The parliamentarians supporting a higher target, including the S&D party, argued that the social and environmental benefits outweighed the costs. Some NGOs and industry groups used the impact assessment to argue for a highly target. WWF, for example, released an infographic showing the trade-offs in implementing a 30 % versus 40 % target, based on the impact assessment (Fig. 1).

5.2. NGOs and stakeholders weigh in

Gierek was weakened further politically when NGOs and industry groups criticized the ITRE report. Many viewed Gierek's moves as an attempt to subsidize coal by driving innovation investment in energy generation, and that the potential for households, industry, the service sector, and small businesses to make energy savings would be lost by drawing the focus away from end-use consumption. The European Environmental Bureau maintained that: "Changes proposed by the MEP go beyond the scope of the Directive, even attempting to redefine the entire concept of energy efficiency […] The report's focus on primary energy savings in power plants, transmission and distribution loses sight of the potential for citizens and final users to make gains" [38]. Friends of the Earth Europe stated that: "According to Gierek, energy poverty can only be fought by making power plants more efficient, de facto supporting so-called cleaner coal. This focus on primary energy disregards the opportunity to act on one of the root causes of energy poverty: leaky, inefficient homes that waste energy and drive up bills".[13] Climate Action Network Europe asserted that: "[Gierek], proposes to dismantle future EU energy efficiency policy and promotes measures that would extend the life of coal power plants" [39].

Industry criticism came from those set to be negatively affected by the proposed changes. EURELECTRIC, a federation representing the electricity industry in Europe, said the proposals for a new methodology would hamper electrification efforts and undermine efficiency improvements and decarbonisation in Europe. Over 50 companies and business organisations in industries that would most likely benefit from a focus on end-use efficiency, such as glass manufacturing, lighting, insulation, electricity and other similar industries, wrote to Gierek asking him to support the Commission's original proposal for energy efficiency to be expressed both in primary and final energy terms, "to ensure a holistic approach to energy efficiency investments and services and provide a legal basis to the promotion of both end-use and generation and distribution efficiency" [40].

Under pressure from his Party, the rapporteur changed the proposed target to 40 % in the ITRE report. A number of amendments were tabled and negotiated, and many of the original proposals were omitted, including the calculation of cumulative energy and the energy efficiency definition. Unable to support the new report that conflicted with his position, Gierek abstained from the vote to approve it, which the ITRE committee narrowly endorsed on 28th November 2017 (33 votes in favor, 30 against, 2 abstentions). The rapporteur stepped down on December 5th to be replaced by another rapporteur. The report to be presented to the wider parliament for debate, therefore, was much less radical, and less complex than that Gierek had originally presented.

5.3. Methodological discussions re-emerge in parliamentary debates

Methodological issues remained a concern for some parliamentarians. One concerned the calculation of the rebound effect. On 29th November 2017, Philippe Lamberts (Verts/ALE) asked the Commission how it factored in the rebound effect when drawing up its objectives and proposals relating to energy efficiency.[14] The Commission posted its reply almost two months later, on January 17th, 2018 - the same day that the parliamentary report was adopted as a plenary resolution (i.e., at a stage that was too late for the EP to make changes). The Commission responded[15] that the rebound effect was included in modelling for the impact assessment, using two values based on a literature review: 21 % and 43 %. The significant range of these two figures highlights the extent of uncertainty in the energy efficiency literature regarding the rebound effect. The Commission explained that when modelling the first scenario of 21 % rebound, sufficient savings would be delivered to reach a 30 % energy efficiency target in 2030. The second value of 43 % rebound effect, however, involved more uncertainty in that it "would require additional measures (such as the recently proposed post-2020 CO2 standards for cars and vans)". Despite this clarification, however, the complexity of the rebound effect appeared to hamper decision-making, as one key informer noted: "It was such a difficult concept […] that not a lot of people were mastering. So, as a result, I think it is also something that was a bit pushed to the background, because people didn't really want to take a decision on it".

5.4. Focus on achieving consensus

Methodological issues were raised during two parliamentary debates on the energy efficiency file.[16] Parliamentarians, however, attempted to firmly steer discussions back to the negotiation of the headline target. Gierek had been replaced as rapporteur by the time the first debate had begun in January 2018, but he continued to argue his position with regards to his methodology. During the debate, Gierek clashed with his fellow S&D Party member, Kathleen Van Brempt, on how the headline target was calculated. The confrontation revealed that the two politicians were supporting different methods of calculation. Gierek was defining energy efficiency as a ratio, explaining that "Energy efficiency is the percentage of energy obtained each time it changes from one state

[13] News item: "How MEPs misuse energy poverty to water down efficiency legislation," . *Energy Post, 15th November 2017.*

[14] https://www.europarl.europa.eu/doceo/document/P-8-2017-007339_EN.html.

[15] The debates were held on 15 January 2018 and 12 November 2018, see: https://www.europarl.europa.eu/doceo/document/P-8-2017-007339-ASW_EN.html.

[16] The debates in January and November 2018 also included the reports on proposals for Governance on the Energy Union and renewable energy).

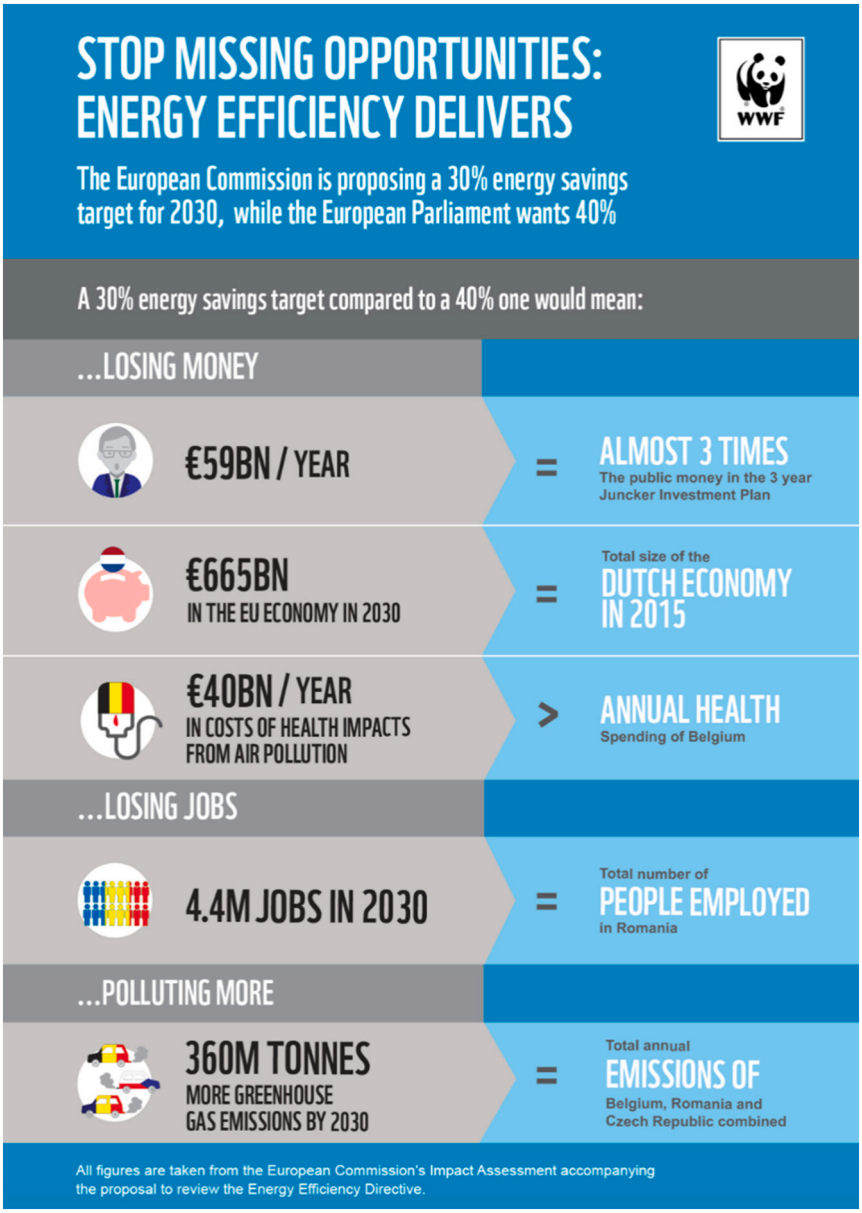

Fig. 1. A flyer published by NGO WWF [37] detailing the differences between a 30 and 40 % target.
See https://www.wwf.eu/?300131/Joint%20position%20on%20the%20Energy%20Efficiency%20Directive%20review.

to another.[17] It can be a percentage of final energy in terms of primary energy, or a percentage of usable energy in relation to final energy." Van Brempt, on the other hand, was supporting the Commission's proposal, which is based on reductions in energy consumption (i.e. whole numbers), not a ratio.[18] Amid the controversy, other parliamentarians attempted to focus the discussion on forming consensus on the headline target. The Shadow Rapporteur for the PPE group, Markus Pieper, said: "Mr. Gierek, I know that you can scientifically substantiate that we are doing a lot of stupid stuff here. But we are politicians, and politicians must also be able to ultimately reach compromises." Similarly, the Parliamentary Vice-President, ALDE's Pavel Telička, said that it was important to move on from the methodological issues and achieve a clear majority vote to strengthen the EP's negotiating position in the trilogues: "I regret on some of the issues we were unable to maintain a broader coalition due to issues which are difficult to comprehend. So let us do a serious vote and let us send out a message and create a good basis for negotiations, because this is key and we do have to be ambitious and realistic".

The parliamentary report was adopted with a clear majority on January 17th, 2018 as a plenary resolution (485 votes in favor, 132 against, 58 abstentions). Gierek's ideas had gained the support of 51 (largely Polish but also cross-party) MEPs. His proposals, however, were not adopted, and he voted against key amendments put forward by his S&D group in the committee vote. The plenary resolution supported a binding EU target of at least 35 % efficiency improvements by 2030, to

[17] Gierek responded by explaining what he called the "technical" definition of energy efficiency. He did this by treating energy efficiency as a ratio between primary energy and final energy, which determines the efficiency of the system. He argued that under this scenario, reaching 40 % was a technical impossibility if the system efficiency was already 63 % (i.e. 40 + 63 % ≥100).

[18] The target (including the 2020 and 2030 targets) is based on an estimation of future energy use (in this case, 2030 consumption) and the target is the ambition to lower that target by a percentage amount [49]. Thus, the target cannot be compared to Gierek's definition, because it is not a ratio and therefore cannot exceed 100 %.

be calculated using the Commission's original proposal, in primary and final energy consumption, and achieved by means of indicative national targets.[19]

5.5. Controversy about what energy efficiency means

Gierek was again vociferous in the second debate in November 2018, arguing that the directive did not measure "real" energy efficiency as he saw it: "Commissioner, the efficiency directive is, in my opinion, a legislative failure, because it concerns restrictions on the use of energy and not real efficiency […] today's vote doesn't show the real solution. The people who voted for the amendment don't understand what it's about. They voted for savings, but that's not efficiency." What he meant was that limits should be placed on primary energy rather than on final energy. In particular, he opposed Article 7 of the directive, which set targets for energy savings. Fellow Pole, Jadwiga Wiśniewska from the ECR supported Gierek in arguing that Article 7's focus on final energy consumption was "confusing energy efficiency with saving energy […] this will threaten economic growth and increase energy poverty". Others from the conservative parties (EPP and ECR) agreed that energy efficiency should be distinguished from energy savings. One informant said: "Within our group we had a very strong opinion that energy efficiency doesn't mean energy saving; energy efficiency is input of coal and output of one unit of GDP". (i.e. energy intensity). The EPP and ECR also put forward a proposal in the compromise amendments [41] which stipulated that Member States could discount extra energy consumption that was consumed in the case where economic growth was higher than expected.[20] This proposal was voted down.

Energy efficiency, however, meant something different to other policymakers. Those from the ENV working group and left-leaning parties tended to describe energy efficiency as a strategy to limit consumption and achieve energy savings, sometimes mixing the ideas of energy efficiency and savings together. The S&D's Jytte Guteland, who was energy efficiency rapporteur for the Committee on Environment, Public and food Safety (ENVI), said: "I was delighted to get the ambition of the Committee on the Environment to 40 percent energy savings by 2030 […] With a goal of 32.5 percent more energy efficiency by 2030, hundreds of thousands of new jobs will be created in Europe, while climate emissions will decrease, our fossil fuel imports will decrease and health will improve." Pavel Telička (ALDE) also aligned energy efficiency with reduced consumption: "We need to focus on the other side of the coin: reducing consumption […] with an emphasis not just on the opportunities in terms of technology, renewables, etc. but also on lowering consumption". The Commission had stated its definition in its impact assessment, that energy efficiency was not about conservation, and should not prohibitively limit consumption. "What the energy efficiency policies aim at is not to cap the absolute amount of energy consumed in a manner that could turn out to be prohibitive in times of high economic growth or a very lax target in times of economic slowdown. Instead, energy should be used in a more efficient way (i.e., using less energy per unit of economic output)" [36,pp.75].

5.6. Parliament negotiates a deal with the Council

Following the first debate and the EP's plenary resolution, trilogue negotiations between the EP, Council and Commission began in February 2018. Major changes were negotiated, effectively watering-down the proposed headline target. One major change was to loosen the requirement for EU countries to make energy efficiency improvements, by removing the obligation to meet *both* primary *and* final energy consumption targets. This went against what the Commission and the EP had wanted. Instead, an option was written into the text to achieve *either* primary *or* final energy as the Council had wanted.[21] This meant that countries could focus on only one part of the target rather than both, i.e., that some industries could potentially be left out of the measurement. According to one informant, this issue had been a major sticking point since 2012, when France and Finland argued to focus only on final energy consumption because they were concerned that a focus on primary energy would incentivize reductions in nuclear power in their domestic debates. The Commission had explained in its impact assessment why it was important to include both primary and final energy consumption in the indicator [36]. It said that if only final energy is counted, then it would generate changes in industry, residential, transport, services and other final sectors, and not in the generation sector and energy networks where "huge energy efficiency potentials exist." [36]. The opposite would be true if the focus was only on primary energy: "Member States could achieve their target without generating any savings in the final energy consumption sectors (e.g. in buildings) if the target is expressed in primary energy consumption only. [If this were the case] Member States could e.g. focus on a shift towards more renewable energies only, instead of aiming for energy efficient housing." [36,pp.75].

Towards the end of the trilogue negotiations, there were calls among industry campaigners and the Commission to keep both indicators in the target. Paul Hodson, Head of Unit for energy efficiency at the Commission, said that keeping with the original "and" formulation "could be 1% different in ambition from having a target that is expressed as being so much in primary or so much in final. That's really quite important and not at all obvious," Hodson told delegates at the annual conference of COGEN Europe (European Association for the Promotion of Cogeneration Europe) on 5th June.[22] COGEN Europe also lobbied for a focus on primary energy, arguing that more emphasis should be placed on making savings in the production and distribution of electricity because of average losses of 60 %, a figure which can reach 75 % for power plants running on biomass, they said. "As long as the electricity sector is not 100% efficient, measuring energy efficiency in primary energy should be considered first".[23] These calls were not applied, however, and as a result of the trilogues, a provisional agreement was reached on 19th June 2018 that set an indicative EU target of 32.5 % efficiency improvements by 2030, and the final text was signed into law on 10th December 2018.

In April 2018, the European Council for an Energy-Efficient Economy released a report [42] that found that the Commission's 2016 impact assessment miscalculated the estimated costs required to meet the energy efficiency targets.[24] The study stated that if the Commission had used the member state average discount rate, costs would have been lower and negotiators could have been freer to push for higher targets and annual savings.

[19] Strengthened provisions on annual (end-use) energy savings obligations were added, and included a broader range of sectors than in the original Commission proposal, including buildings, transport, heating and cooling.

[20] "Where a Member State has not based its contribution on energy intensity, it may detail in its integrated national energy and climate plan […] its expected level of industrial output in 2030 and may subsequently exclude from counting towards its contribution for 2030 any energy consumption resulting from excess industrial output." (European Parliament, 2017 pp. 5).

[21] The final text read: "has to be no >1321 Mtoe of primary energy and/or no >987 Mtoe of final energy.

[22] News item: "Primary' energy efficiency in focus as EU talks near finishing line" Euractiv, 8th June 2018.

[23] News item: "Primary' energy efficiency in focus as EU talks near finishing line" Euractiv, 8th June 2018.

[24] When the Commission produced its initial energy efficiency proposal, it used a discount rate of 10 % to come up with its 30 % binding target, judging it to be the most cost-effective option. However, an April 2018 study by the European Council for an Energy-Efficient Economy (ECEEE) insisted that 10 % was too high compared to a member state average of just 5.7 % for buildings.

6. Discussion

This case study offers insight into a political struggle that revolved around the definition and quantitative articulation of energy efficiency. The case is unique because Gierek's initiative created a temporary opening for a space where definitions of energy efficiency and the way energy efficiency is measured became negotiable. Similar to Asdal's [5] findings, the "numerical technologies" of defining and calculating energy efficiency help produce "a governable space which then lends itself to political intervention" (pp. 125). The creation of this space was enabled by the normal parliamentary negotiation proceedings over the draft ITRE report. Importantly, however, the rapporteur - defying protocol – used another document and attempted to rewrite the Commission's amendment proposals, putting forward radical new ways of defining and measuring the headline indicator. Gierek's actions resulted in a politicization of energy efficiency indicators, because he helped reveal conflicts and trade-offs inherent in a their expression. We can see in this case that there were a clash of diverse party interests, lobbies, industries and countries in the way that they conceptualized energy efficiency and also in the way that they constructed energy efficiency measures and indicators for their own perceived gains.

Paradoxically, however, a number of political processes and practices of the EU's OLP resulted in the opposite process, that actually depoliticized the energy efficiency issues. A significant part of this depoliticization was the ambition of many policymakers to reach a compromise for political gains, especially under time pressure. The downside of forming compromise under such conditions was that policymakers were effectively shutting down and taming the issues that others, especially Gierek, had raised. The sticky issues included where to draw the boundary of measures, whether more onus should be placed on industry to make energy efficiency gains, and whether more attention should be paid to the rebound effect and tackling scientific uncertainty. These controversies reveal that policymakers had different epistemological backgrounds and different areas of expertise, which clashed when it came to legislating energy efficiency policy. For example, in the view of his parliamentary and Commission colleagues, while Gierek had a strong technical engineering background, he lacked communication skills, including the language necessary to speak with colleagues (both English itself and expressing ideas in a way that colleagues could understand). His parliamentary colleagues, on the other hand, had expertise in political negotiation and compromise, but lacked the skills necessary to understand trade-offs in the formulation of energy efficiency measures and indicators. These disparities resulted in less-effective policy that would otherwise have occurred with practitioners who had a better grasp of all aspects of the process.

6.1. How the political process depoliticized the issue: the technologies of politics and "thing-work"

The Commission's impact assessment helped shape the political negotiations because it was the go-to reference for policymakers to argue how high or low the headline target should be set. It broke policy choices down into crisp, clean, understandable scenarios measured in dollar terms, jobs and greenhouse gas emissions, thus acting as a useful tool to defer to when difficult and complex choices needed to be made. Different actors used the impact assessment for their own gain, to strengthen arguments both in favor of, or against, a higher or lower target. In this way, the impact assessment kept discussions centered on the target level rather than the methodology used to calculate it. While the appeal of this document was its clarity, on the flip side it tended to deal with complex issues in a fairly simplistic way. For example, regarding the rebound effect, the options were neatly presented with an explanation that the lower estimate (21 %) was favored over the higher estimate (43 %) because the lower estimate was the most recent finding. But this type of simplistic treatment belies the fact that science still cannot accurately determine the true extent and nature of the rebound effect. Another problem was that the Commission's response to a parliamentarian's question with a typically cut-and-dried explanation of how the rebound effect was factored into modelling – with the response arriving too late for the parliament to take the answer into account in their conclusions.

The debates were in theory a place to openly discuss disagreements, but they became a place where the conversation was shut down and energy efficiency was turned back into an apolitical object. Whenever points were raised about methods, the conversation was swiftly turned back to the priority for parliamentarians as they saw it – reaching a consensus on the headline target. There was simply no more time nor space for in-depth discussions. Gierek, on the other hand, had argued that the way energy efficiency was measured would have more effect on energy savings than the level of the targets – but his arguments were lost in the louder conversation that proceeded it about the headline target level and assumptions that the higher the better.

Finally, the process of negotiation in favor of the Council during the trilogues meant that EU member states had significantly more flexibility in whether to focus their progress towards the target on primary or final energy efficiency. This means, on the one hand, that countries may choose to ignore the sectors precisely where Gierek wanted change in primary energy. Another downside of this scenario, according to the impact assessment, is that member states could potentially shift attention away from end-use consumption and "focus on a shift towards more renewable energies only, instead of aiming for energy efficient housing" [36,pp.75]. This latter example illustrates how energy efficiency and renewable energy objectives can conflict in practice.[25] For example, to avoid the complexities and policy challenges presented by Gierek's interpretation of efficiency and energy sources, primary energy consumption could be instead measured and captured by the Emissions Trading System rather than through the energy efficiency directive. This would also avoid uncomfortable tradeoffs of energy efficiency in disincentivizing decarbonisation by reducing the price on carbon in carbon trading.

6.2. What do we learn from studying the politics of energy efficiency indicators?

The nature of energy efficiency is that, on the one hand, it can bring actors together in agreement to support energy efficiency policy, because the broad goal and outcomes appear to mean the same thing: using energy less wastefully; and more recently in EU policy, it means benefits for society in the forms of poverty alleviation, jobs and a better environment.[26] But what is apparent when it is broken down is that energy efficiency can mean very different things when it comes to the way it is implemented through indicators. This finding is reflected in historical EU policy [23]. Table 1 below outlines these differences in the epistemic basis of different conceptualizations and what the various enactments of energy efficiency when attached to these meanings.

To Gierek, energy efficiency concerned the "technical" ratio rather than energy savings, focused on systems efficiency with the headline indicator expressed as cumulated primary energy. To some, energy efficiency meant energy intensity, and not savings. Others however, wanted to focus on a reduction in overall energy consumption. What was being played out in parliamentary discussions was a common conflict and confusion over whether energy efficiency meant relative efficiency,

[25] For example, in the energy efficiency legislation, renewables are given an artificially high PEF factor in order to incentivize their use. What this means is that renewables are considered 100 % efficient when in fact they are often comparatively inefficient. Solar panels, for example, are comparatively inefficient to other technologies, at between approximately 20–25 % efficiency [50].

[26] The typically broad definition of energy efficiency that has been agreed on since 2012 (energy efficiency means the ratio of output of performance, service, goods or energy, to input of energy) reflects this ambiguity.

Table 1
Different enactments of energy efficiency among policymakers and institutions.

Group/ institution	Preferred headline indicator	Narrative meaning/ definition of energy efficiency	Enactment
Commission	Primary and final energy consumption	Energy should be used in a more efficient way (i.e., less energy per unit of economic output)	A mixture of relative efficiency, where overall savings are not necessarily achieved, and absolute energy savings (Article 7).
Gierek and ITRE	Cumulated primary energy (including pre-conversion phase)	Energy efficiency is not about energy savings but about being efficient, especially energy generation and conversion processes	Relative efficiency, where overall savings are not necessarily achieved
Conservatives	Energy intensity	Energy efficiency does not mean savings	Relative efficiency, where overall savings are not necessarily achieved
S&D and Greens	Primary and final energy consumption	Energy savings, reducing/lowering energy consumption	Absolute energy savings

where overall savings are not necessarily achieved, OR, whether it means a reduction in overall consumption and energy savings in and of itself, more akin to energy sufficiency or conservation principles. The differences in meaning highlight the role of ambiguity in energy efficiency politics. According to political scientists, ambiguity is an essential ingredient in policymaking: "Ambiguity enables the transformation of individual intentions and actions into collective results and purposes. Without it, cooperation and compromise would be far more difficult, if not impossible" [43,pp.178].

It is, nevertheless, important to analyze the underlying differences of opinion in the meaning of energy efficiency, to understand what are the various effects of policy implementation and different enactments of energy efficiency. In doing so, we aim to contribute to the very context-specific and situated analyses that energy social scientists have called for [19,20]. By focusing on primary, rather than final energy, Gierek was enacting an energy efficiency that was distinct from that of the Commission, i.e., one that focused more on production than consumption systems. While Gierek argued that targeting primary energy would help to reduce energy losses and alleviate poverty by taking the burden off consumers to reduce energy at the final end of the chain, the Commission made the opposite argument, that the best way to tackle energy poverty is to improve energy efficiency at the final energy consumption stage. Who is right? A pertinent query here is to what extent consumers would benefit from more targeted measures to improve energy efficiency on the supply side, where significant savings can still be made. Comparatively richer EU countries may argue that there are few economic gains to be made in primary energy industries (supply side), but this should not overlook the fact that richer nuclear-dominant countries advocate for measures that shift the focus away from making nuclear energy generation more efficient. Nuclear is arguably inefficient when taking costs, slow construction times and nuclear waste into consideration. Despite its downsides, nuclear energy receives favorable treatment when comparing its efficiency to other energy sources, in the form of the primary energy factor.[27] This special treatment puts into question the utility of applying the energy efficiency concept if indicators and measures are used to prop up wasteful and expensive industries. This issue is more relevant given the recent public outcry over the Commission decision to include nuclear on the list of "sustainable investments" in its recently created EU taxonomy.[28]

Thus, in this case, it is not necessarily energy efficiency that counts, but *how* energy savings are made that is important. This can be seen in the case of Gierek's proposed methodology to measure energy efficiency. He was criticized for supporting coal because of his focus on generating innovation in primary energy efficiency. Given the reliance of Poland on coal for citizen's livelihoods, it makes sense that Gierek and his Polish parliamentary colleagues would advocate for efficiency measures in coal. There are potential energy efficiency gains to be made in coal plants, however, this option was not politically desirable to others who saw the move as supporting the fossil fuels industry. Although coal may be a 'dirty' fuel, supporting it may arguably sustain Poland's energy poor. Thus, the question arises: how do we deal with energy inequalities – in terms not only of who is richer or poorer, but also of who consumes more per capita, and how does their energy mix affect energy poverty? This is a familiar conundrum at the crux of global climate negotiations – who should bear the burden of emissions reductions? The answer is not simple and requires more than the current policy process to solve. Unfortunately, the format of EU policymaking involving the use of impact assessments and technical documents tends to favor a technocratic type of governance tht doesn't leave room for more diverse viewpoints and perspectives to be heard. More wider citizen involvement in energy efficiency policy could help to weigh up complex issues to do with values, identities, culture and inequality with regard to energy use.

While the Commission's proposal focused more on energy savings made at the end of the energy chain, it is largely consumers and taxpayers who foot the bill for many of these initiatives, unless funding comes from the public purse. Improvements, for example, include housing insulation, buying more efficient appliances and more transparent billing practices by energy companies. These strategies are seen as 'win-win' because they support growth in industry, for example in glass, insulation and electricity companies, while at the same time helping consumers save money from the energy they save. There still exist, however, perverse incentives that, for example, reward energy companies for the energy they sell rather than for cutting bills; that pay architects and engineers for what they spend, not what they save; and that put the burden for renovation on renters, rather than on apartment or building owners. Furthermore, as the rebound effect literature shows, for e.g. [44], citizens may not necessarily be incentivized to reduce

[27] The Primary Energy Factor (PEF) is the rate to which electricity is converted between different stages in the energy chain. It should reflect how much primary energy is used to generate a unit of final energy (e.g. electricity or thermal energy) through the use of consumption indicators. The current PEF for electricity that is prescribed within the European Union, as detailed in the Energy Efficiency Directive 27/2012/EU, is 2.5. That implies that each unit of electricity requires an input of 2.5 units of primary energy to produce it. So, for every unit of electricity consumed in our homes, 2.5 times more energy was needed to generate it. Therefore, the greater the difference between primary energy consumption and final energy consumption, the larger the implied losses throughout the energy system. For nuclear, this figure is placed at 3/1 which is more generous than conventional power stations which have a PEF ratio of 2.5.

[28] https://www.euractiv.com/section/energy-environment/news/investors-warn-green-label-for-gas-undermines-eu-taxonomy/

energy overall, but rather to use it at a more efficient rate, for example through more efficient appliances. A nuanced policy to reduce energy use and energy poverty may be more effective in this regard, for example, policies that focus on absolute reduction in energy such as zero energy buildings (focusing on a mix of renewables, energy sufficiency, and energy efficiency) whereby buildings generate more energy than they consume [45].

Overall, this research highlights how a certain way of measuring energy efficiency also contributes to stabilizing a certain imaginary of energy production and consumption together with an imaginary of science and measurement that goes with it – and that this imaginary could be very different depending on the various interests and actors at play.

7. Conclusion

This study has revealed some of the disputes over political priorities, values and trade-offs by applying a sociological lens to energy efficiency indicators. This study builds upon the so far sparse literature on the politics of energy efficiency measurement. By treating energy efficiency as a governance object, we have shown how the dichotomic processes of politicization and depoliticization occur in energy efficiency policy - through so-called 'technical' methodological discussions and policy processes that use their own quantitative language - which may be difficult for non-experts to understand. Through a politization of the issues we were able to glimpse some of the sticky issues that impair the energy system, including special treatment for certain industries, loopholes for EU countries and a lack of focus on overall consumption reduction. Opening up these governance issues and in tandem understanding how they become depoliticized through bureaucratic processes is key to understanding how to improve policy. A first step would be to openly discuss the tension between relative and absolute efficiency. The application of "energy sufficiency" principles has already gone some way to doing this, by pushing to openly discuss the subjectivities involved in placing absolute limits on energy consumption. For example, an emphasis is placed on better understanding what constitutes 'needs' and 'enough' in terms of consumption: are two cars per family too much? How much living space is enough? Is air conditioning set at 18 degrees Celsius necessary? Meaningful change will only occur when we openly address these societal issues and alter our energy supply and consumption systems, and the systems that govern them, to live sustainably.

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Data availability

The data that has been used is confidential.

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