Introduction to Panel 2 Future and innovative policies

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Introduction

The role of energy efficiency is changing in a world where more and more countries are aiming for net zero by the middle of the century. The need for the buildings and transport sectors to almost completely decarbonise even by 2040 is starting to hit home. Electrification lies at the heart of the end-use decarbonisation challenge, including in many industry sectors. At EU level, the Fit for 55 Package of legislation requires Member States to increase ambition levels during the 2020s across the board, including on energy efficiency. At the same time, partly as a result of the energy crisis, policy makers are more aware then ever of the need to ensure an equitable and just energy transition. The Fit for 55 Package contains new provisions that require Member States to prioritize action amongst low-income, energy poor and vulnerable households.

In panel 2, we are asking how energy efficiency policies are innovating in this fast-moving environment and what the innovative policy measures are that work to ensure that all groups can benefit from the energy transition.

Policies emerging from recent crises

The COVID-19 crisis led to some radical and swift policy decisions while the war in Ukraine forced a new round of drastic policy changes, aimed at securing sufficient energy supply and managing the distributional implications of markedly higher energy prices. Meanwhile, climate change is leading to more extreme weather events with impacts on the reliability of electricity supply, while the variability renewable energy production and the flexibility of increasingly electrified end-use equipment is changing the policy *status quo*. What did we learn from the recent crises and how policy makers reacted? Meier *et al.* (peerreviewed paper 2-035-24) analyse recent responses to short-term electricity crises, pointing out the policy paradox that grid authorities insist that they cannot rely on behavioural actions to mobilise demand-side electricity consumption reductions, while relying on them at times of crisis. They identify key success factors among reviewed policy actions and suggest further actions to make emergency behavioural response measures a creditable policy tool. Gram-Hanssen et al. (extended abstract 2-040-24) assess the impacts of the Ukraine crisis on household behaviour, pointing out the increased take-up of time-of-use tariffs and awareness, indeed daily monitoring, of changes in energy prices. They highlight the links between tight household budgets and/ or interest in the environment and engagement in time-shifting energy consumption practices, providing policy recommendations on flexible pricing, the sustainable transition and energy poverty. Eriksson & Gråd (extended abstract 2-039-24) assess ten compensatory policy measures put in place in Nordic countries in response rising electricity and transport fuel prices. They find that most of the measures weakened incentives for energy saving and investments in energy efficiency, while not effectively targeting the most vulnerable households and businesses, with some even being regressive. They make policy recommendations for how to design policy measures to avoid these impacts.

Policy perspectives on the changing demand side

The electrification of more and more end-uses and the increasing share of variable renewables in the supply of electricity are changing the demand-side, with the ability to reduce and shift demand flexibly becoming increasingly valuable. In parallel, among the multiple benefits of energy efficiency, its value to the

energy system is increasing, with its flexibility capital emerging as a new focus for policy makers. Parag et al. (extended abstract 2-002-24) explore the "long tail of the grid's edge", examining new technologies, market players and emerging business models and their impacts on the achievement of energy and climate policy objectives and distributional impacts. They highlight emerging policy challenges for system planning, affordability, equity and cybersecurity protection. Yule-Bennett & Sunderland (peer-reviewed paper 2-297-24) address the barriers to lower income households offering the flexibility of their energy use, highlighting the need to ensure adequate fabric insulation in buildings to enable their use as flexible assets. They also point to the need for tariffs, products and services that offer benefits without exposing households to excess risk, or the removal of social protections. Granda et al. (peer-reviewed paper 2-095-24) examine the flexibility potential of electric storage water heaters as the electrification of domestic water heating gathers pace and the demand for flexibility increases. They survey the market and regulatory environment for smart water heaters, setting out three broad approaches for engaging with end users: timeof-use tariffs, aggregator mediated programmes and California's "prices to devices" approach.

Lessons from recent policy assessments

A thorough evaluation of the effectiveness and efficiency of policy measures is an important cornerstone for improving energy efficiency and measuring energy savings not only at national but also at local level. Such evaluations also help to understand the performance of policies in comparison to others and to better design future policies to meet energy and climate targets. Kostic et al. (extended abstract 2-284-24) analyse the grid impacts of the City of Seattle's Buildings Emissions Performance Standard (BEPS) by applying the modelled outcomes of several efficiency and decarbonisation measures to building benchmarking data. The results show that BEPS will have multiple impacts on both customers and the grid, helping the utility to plan more accurately for the coming decades. Thomas et al. (peer-reviewed paper 2-220-24) assess whether an ambitious policy package could achieve the goal of a greenhouse gas-neutral building sector in Germany by 2035. The results show that this is theoretically possible, but that in reality such an ambitious programme is very difficult to implement, mainly due to the expected negative social impacts. They conclude that a much stronger focus on climate justice will be crucial for the (re)acceptance of energy-efficient renovations and low-carbon heating systems. Oprea et al. (peer-reviewed paper 2-111-24) also take up the social aspects of energy efficiency policies and their ability to tackle energy poverty. They identify shortcomings, particularly in the private rented sector, and show that stakeholder involvement can help to redesign policies to better address the problems inherent in the PRS and achieve greater social acceptance.

Getting off gas and renovating buildings for the health of nations

Health impacts have become more widely acknowledged in the energy efficiency field over the last decade, however there is still a large gap between the fundamental science and policy outcomes on the ground. Gas is still widely used for cooking in several countries. Building renovation is rarely undertaken for health reasons. And energy and carbon-intensive meat-based diets could be discouraged through a stronger linkage with health detriment. Stobbe et al. (peer-reviewed paper 2-205-24) address the imperative to transform the gas network in an efficient and orderly way. They make recommendations including the dropping of requirements for distribution system operators to connect consumers to the gas grid and providing incentives for the decommissioning of gas networks. Scholand (peer-reviewed paper 2-330-24) focus on the use of gas for cooking, presenting the evidence on the various environmental and health impacts and the benefits to users of cooking with electric induction hobs. They provide policy recommendations across the Ecodesign, Energy Labelling and Gas Appliances Regulation. Düvier et al. (extended abstract 2-073-24) assess the extent to which health benefits more generally are reflected in energy efficiency policy design. In examining case studies across Europe's main climate zones, they show a lack of data availability for many of the key indicators and propose amendments to policy measures to ensure that energy efficiency policies in buildings are conditional on health indicators. In a display, Alexander-Haw et al. (extended abstract 2-157-24) show the results from a demographically representative survey in France, Italy and Latvia on the acceptability of policies aiming to lower meat consumption, with randomised framings about health risks associated with meat consumption. They find that meat taxes are the least accepted policy measures and that, at least in France and Latvia, "veggie days" enjoy a higher acceptance than carbon labels.

Creative policy concepts to boost energy efficiency

Energy efficiency is often neglected in favour of other decarbonisation options. It is therefore all the more important to keep emphasising the high relevance of energy efficiency and its multiple benefits through innovative policy approaches. Balsiger & Jeanneret (peer-reviewed paper 2-243-24) explore the question of why energy efficiency measures "do not get the pulse racing", though they are, compared to many supply projects, much easier to implement. As an answer, they focus on the relationship between energy savings impact and attention aspects and illustrate this with examples from Switzerland. Slingerland et al. (extended abstract 2-138-24) refer to the "Beyond Growth" debate, and analyse and compare eleven alternative economic concepts currently discussed in the Netherlands. Overall, they conclude that these concepts need to be further explored before they can be put in practice, and give some indication of the direction this might take. Irrek (peer-reviewed paper 2-034-24) addresses the shortage of skilled labour discussed in many countries as a major obstacle to the energy transition and discusses it using Germany as an example. He concludes that the augmentation of technical workforce development can only be increased if all private actors intensify their innovative recruiting strategies and if policy establishes adequate framework conditions.

Innovative approaches to regulation

Energy efficiency regulation must adapt to new challenges, including how to deal with factors that affect energy consuming systems and to encourage energy savings at the level of systems, as opposed to individual components. Bennich et al. (extended abstract 2-336-24) examine the challenges to the uptake of smart lighting systems and the realisation of their savings potential. They highlight the benefits from the harmonisation of standards and regulations and the standardisation of lighting metrology, explaining the role of the IEA 4E Smart Sustainability in Lighting and Controls Platform in defining, testing and regulating smart lighting systems. Rama (extended abstract 2-234-24) examines the impacts of software on the energy efficiency of smart devices. He explores the scope for applying a horizontal approach to legislation, looking at the Ecodesign for Sustainable Products Regulation. He investigates how this could be translated into practice, including the possibility of requirements to ensure software updates do not result in increased energy use or early obsolescence. Renkens & Stadler (extended abstract 2-317-24) assess the challenges of regulating energy suppliers to deliver energy efficiency improvements, also looking at how to promote systemic approaches to energy savings, instead of more traditional component-based approaches. They examine how lessons from other countries can be transferred to the Swiss case, in order to quickly generate significant electricity savings.

Embedding sufficiency in the policy mix

Energy efficiency policy alone is not enough to turn around the rising demand for environmentally costly energy services. Instead, there is the need for an additional policy paradigm of "energy sufficiency" which also takes into account the need for reducing energy uses beyond technical efficiency. Schnurr et al. (peer-reviewed paper 2-186-24) investigate the structures needed to facilitate sufficient livelihoods as well as the barriers by jurisdiction and the respective regulatory framework at the example of three conceivable sufficiency rights from the mobility and housing sectors. Their paper points out how adequate political measures and planning ground rules backed by an appropriate legal framework can facilitate sufficiency at all levels of society. Wei et al. (extended abstract 2-121-24) explore the role of technology and policy levers in developing a sufficiency-oriented research agenda for an equitable energy transition using the example of buildings. With their analysis, they want to stimulate the broader community towards developing innovative and fresh perspectives for implementing a sufficiency-first approach for building decarbonisation. Finally, Rohde et al. (extended abstract 2-242-24) examine the lessons learned from selected sufficiency policies focusing on the floor space used by households. The analysis indicates the impact of circumstances on the success or failure of the policies studied and derives recommendations to improve future policy design.

Heating and cooling: the next decade's decarbonisation challenge

The reduction and decarbonisation of energy demand for space heating and cooling is one of the key challenges to achieving climate neutrality by mid-century. Based on the significant increase in energy demand for space cooling over the last decade, Pezzuto et al. (peer-reviewed paper 2-118-24) analyse how policies could be improved to ensure summer comfort in a sustainable way. They conclude that space cooling is an issue that illustrates well the need to consider more integrated approaches, moving beyond siloed technical solutions and addressing mitigation and adaptation together. Fritz et al. (peer-reviewed paper 2-099-24) assess the effectiveness of heating and cooling plans, as they are foreseen for larger municipalities in the revised EED, using the example of a German federal state, where such plans are required since 2020. Their findings can help policy makers and stakeholders in other regions to develop effective heating and cooling plans. Sabbadin et al. (extended abstract 2-166-24) use a modelling approach to examine the investment costs of replacing fossil fuel boilers with renewable heating technologies in a number of EU Member States. The results show that a manageable additional investment of €21 billion over the next decade - based on a mid- to low-income household - could be sufficient to ensure a fairer and cleaner energy landscape. In a display, Shirsath & Sarraf (extended abstract 2-216-24) present a study aimed at estimating appliance ownership and consumption behaviour in the residential sector in India. Their modelling approach is based on aggregated subhourly household electricity consumption data for three Indian states. The results can be used to better design demand-side and other user-specific measures to reduce household energy consumption in India.

New Evaluation Tools to Support Innovative Policy

In a joint theme with panel 4, new evaluation tools based on measured or modelled data and indicators are presented. Such tools are very important to support the success of innovative energy and climate policies and also to improve the data base for energy and climate scenarios. From the perspective of panel 2, Burghardt *et al.* (extended abstract 2-257-24) point to the urgent need for a better consideration of sufficiency in energy demand modelling. However, there is a large data gap for quantified energy savings potentials of sufficiency measures. To fill this gap, the authors developed an open access database with quantified potentials of sufficiency policies and measures for Germany. The database is based on a systematic literature review and can help both modelers to better consider sufficiency in their scenarios and policy makers to better understand the energy savings potentials of sufficiency measures.