Energy Saving in a Hurry: A Research Agenda and Guidelines to Study European Responses to the 2022-2023 Energy Crisis

Abstract:

This winter exceptionally high energy prices are forcing many householders and businesses in Europe to change the way they use energy. It is important to learn how their energy use changes over a short period of time, the effects of government actions, which policies work and which fail, and what trade-offs emerge. The digital society offers unique opportunities to collect quantitative and qualitative data and to learn about these changes while they happen. However, researchers are not used to planning and executing rapid research. We propose a research agenda and some guidelines and thoughts on practical aspects of executing research in a hurry. The frequency of energy shortages due to extreme weather events is likely to increase. Therefore, lessons from good research on coping strategies, and on the economic, social, and environmental implications of this are vital for better policymaking. As researchers, we should try to follow Winston Churchill's advice 'never to waste a good crisis'.

Keywords: energy saving; energy research; energy emergency

1. Introduction

In 2021 40% of EU natural gas was imported from Russia with variation between countries: Austria imported 86% of its natural gas from Russia, Finland 75%, Greece 64%, Poland 50%, Germany 49%, and Italy 38% [1]. The decline in Russian gas exports to Europe following its invasion of Ukraine in early 2022 created a natural gas shortage and there have been price surges across the continent. Increasing demand for energy since COVID-19 restrictions ended has added to price rises and as a result Europe is facing record natural gas prices which are also feeding into high electricity prices in many countries [2]. In winter 2022/23 households across the EU are experiencing a surge in energy prices, with the impact on poor households being most significant [3]. Many vulnerable households are struggling to maintain thermal comfort and some have to choose between energy and other essentials including food and health. Businesses are suffering too.

Governments are already implementing coping strategies that target both energy supply and demand, including, for example, sourcing natural gas from elsewhere than Russia, switching fuels, spending hundreds of billions of Euros on subsidies, price caps, relief packages for vulnerable households, and reducing taxation on energy [4]. Measures to reduce or reshape demand, include energy rationing for industry, mandatory reduction of peak consumption, information and advice campaigns, and two-tier tariffs. The European Union has adopted a regulation to reduce gas demand voluntarily by 15% between August 2022 and March 2023 (EU Regulation 2022/1369). For a review of energy saving policies across Europe see [5]

This is not the first large-scale energy crisis that requires a significant reduction in energy consumption – oil, gas, or electricity – with relatively little notice and a short time to adapt. Such events are well-documented in the literature on "saving energy in a hurry" [6-9]. The 2005 IEA guide for electricity saving in a hurry was last updated in 2011, and depicts lessons learnt across different

countries and energy systems, including Japan, New Zealand and Brazil .

From a research point of view, the 2022-3 energy crisis and the constraints that many consumers (households and businesses alike) are experiencing this winter, present opportunities to study demand reduction and flexibility in a digital society, from the point of view of users, in a comparative manner (between and within nations), and to learn about energy resilience, coping strategies, as well as societal hardship. As most natural gas in Europe is used within buildings, rather than in transport or energy-intensive industry, this is our focus.

It is too early for reliable energy consumption statistics for winter 2022/23, but UK figures on residential energy use in the third quarter of 2022 show total temperature-adjusted residential energy use was down by 13% compared with the same quarter the previous year, likely due in part to price increases [11].

The availability of more granular geographical consumption data as well as access to mobile phones and social networks are assets that were not widely available several years ago, and could be utilized to collect both quantitative and qualitative data about and from users on the events while they happen, rather than in hindsight. Reporting on decisions after the event has ended is often shaped by the consequences, and therefore may be biased [10]. Analysing data collected in real-time could yield insights and lessons that help improve societal resilience, and prepare better for climate-induced or other shortages. However, researchers do not typically undertake research at such short notice, and often lack the resources to do so. Thus, this commentary first sets out a research agenda in more detail, followed by practical suggestions for doing research in a hurry, building on lessons from COVID-19. It considers the risks as well as benefits, and which elements of research practice are most amenable to acceleration.

2. Research agenda

The aim of this proposed research agenda is to highlight sets of questions focused on understanding in detail how households and organisations respond to energy price rises and/or shortages in the winter of 2022/23, the social, economic and environmental consequences, and which behaviours, practices and policies most effectively mitigated these. Detailed example research questions are suggested below, separately for households, organisations and policy.

2.1 Households

- How are different segments of society coping? Looking, for example, by income deciles, ethnic group, age, household composition, settlement type, personal values, vulnerability, and intersections of these characteristics.
- How do household energy subsidies affect response to high prices? What do people do with the money?
- Which new and old energy-using practices emerge?
- What trade-offs do people make between different types of expenditure, for example between eating and heating?

There are specific challenges of researching with vulnerable households during this very difficult period. For example, serious risks to children's health are feared as a result of increased fuel poverty [11]. Many households will be in distress and may adopt risky means of keeping warm – researchers will need training to deal with encountering such situations and managing the emotions they evoke.

2.2 Organisations

- What are the energy trade-offs in business - are processes re-designed to reduce energy and/or material inputs?
- How do organisations make use of cheaper, more flexible energy tariffs, if these are available?
- How is the crisis affecting current practice and future plans around energy efficiency and related investments?
- What characteristics make it easier for organisations to save energy during the crisis? Which decisions are most successful?
- How do work practices change? Are employees encouraged to work from home? Do they prefer to work from offices to reduce their household energy expenditure?

Organisations vary hugely in size, sector, function and purpose and include the private, public and not-for-profit sectors. The consequences of high energy prices could range from bankruptcy, through greater reliance on public money, reduced operational hours and maybe even improved operational efficiency. Research strategies will need to take account of this variability, and be certain not to overlook SMEs, which are responsible for around 50% of all business energy use. This winter, as many businesses in Europe are facing price increases of more than 100%, the business case for energy efficiency has never been stronger. It presents an opportunity to compare the influence of financial barriers and non-financial barriers. Understanding which organisations are able to make energy efficiency improvements and which continue to miss savings opportunities will allow policy makers to make more targeted interventions.

2.3 Policy

- Are there changes in policy and price structures to provide greater flexibility and reduce peak electricity or gas demand? What is the response to these?
- Do countries learn from each other's policy and governance responses? Is there cross-governmental learning and policy transfer?
- How and by whom is useful energy saving advice delivered, both for households and business?
- Have public perceptions of climate mitigation, energy independence, and energy security changed and, if so, how?

Government policies are changing frequently as energy prices vary and political pressure to respond mounts, thus energy prices may differ greatly between households and businesses depending on their situation and the policy package in place. Detailed descriptions of public support across the research period will be vital to good quality analysis.

3. Doing research in a hurry

There is a long-recognised tension between speed and quality in research. Research done too quickly, without adequate attention to existing knowledge, methodological rigour, best practice in research design and research ethics, can lead to poor quality results. The challenge is to speed up while still producing good quality work. Doing research in a hurry can be described in three phases, each of which must be accelerated: designing and initiating the research; undertaking the research; publishing / sharing results. But first, researchers have to find the resources to do the work.

Funding is a crucial aspect of doing research in a hurry: significant new research generally requires additional or re-purposed funding. Here governments and funding bodies can learn from what worked well in their response to COVID-19. The UK's research and innovation funding body (UKRI), sought to mobilise the research and innovation community to produce usable/actionable knowledge in the short-to-medium term that would be relevant to the needs of government and other actors. An independent process review found this aim had largely been achieved, and that good quality research of value to key stakeholders had been funded [12]. However, in order to deliver responsible, quick decisions on research funding, the normal systems had to be side-stepped and new processes improvised by staff working long hours. The review suggested that administrative procedures should be streamlined, to allow faster response in future crises [12]. So, given some administrative improvements, current systems can respond swiftly and effectively to provide funding for research in a crisis - perhaps the challenge is achieving recognition of the crisis.

High quality, ambitious research can emerge from working in turbulent, rapidly evolving, real-world settings by taking a pragmatist approach to research design [13]. Tactics for speeding up research design include making best use of existing research; collaborating with relevant research partners and gatekeepers such as local communities / municipalities / professional organisations / institutions that can facilitate access to research subjects; identifying and securing flexible funding and other resources. For comparative international empirical research, identifying research partners in other countries with existing data collection activities will enable synchronised and calibrated analysis. The EU's 'PartnerSearch' platform could be modified and used to help with this.

Once the research design is in place, the research process can be accelerated by using existing research platforms, tools, and target groups for which baseline data is already available. For example, researchers should use existing research panels, survey instruments, research observatories with smart meter/ other building measurement data sharing agreements in place e.g. via national and Horizon2020 or HorizonEurope projects. The European Joint Research Centre (JRC) has been collecting data related to energy, societal resilience, health and the environment in EU states for many years, and this readily available information provides good baselines for comparison. The JRC also publishes guidelines for common methodology which will ensure high quality comparisons. Remote and digital research methods for data collection, previously done in person, enable safer and quicker research. These include smart metering data as well as mobile phone apps and social networks as means of reaching various segments of society, which sometimes are overlooked. Challenges will remain around research capacity, research ethics, privacy, and data protection.

The availability of large quantities of digital data creates its own problems, and digital is not necessarily synonymous with speed. As argued in a commentary about evaluation in the climate emergency [14] while digitalization enables greater scope for measurement and monitoring, it also places new demands on data users. Researchers typically do not collect the data themselves and will need to agree to licensing and sharing protocols with multiple stakeholders. Before analysis can begin, data cleaning, reformatting, and quality assurance are often required. Experience suggests that these processes are time consuming. Thus, researchers already working with big datasets are best placed to do this work.

Who can do research in a hurry? Given the importance of making use of existing data collection exercises, networks and partnerships, doing research quickly favours more established research teams. There is less time available for additional training of less experienced staff and/or new skills acquisition. Rapid research cannot rely solely on early career researchers. More generally, there is also the question of capacity, and whether national research management and employment structures allow either expansion or re-direction of research staff.

Publishing research in a hurry can mean making data available via reports or preprints rather than through peer-reviewed academic papers. Preprints can be published in advance of journal publication: these allow early access to, and scrutiny of, research findings, with no affordability constraints, and offer the advantage of speed [15]. Alternatively, peer review can be accelerated, but this is not straightforward and can militate against rigour, as seen in medical research during the pandemic [16]. What gets published is also influenced by journal policies and journal editors, and the degree to which they prioritise and dedicate resources to reviewing articles on hot topics.

The tension between speed and rigour cannot be wholly resolved. However, Table 1 suggests ways to reduce the risks of greater speed.

Table 1: Addressing the challenges of researching in a hurry

Challenge of research in a hurry	**Mitigation**
Lack of dedicated funding	Research funders to make flexible funding available & speed up administrative process. Research leaders to add new research questions to existing funded projects.
Less time to plan & design research	Make use of existing platforms, research instruments and protocols. Collaborative discussions amongst established researchers. Working with established gatekeepers / intermediaries. Front-loaded effort to set objectives and plan simultaneous collection and analysis of data
Tensions between speed and rigour at all stages of research	Prioritise research approaches & research management which can be done more quickly.

	Risks in adopting new data collection methods can be offset by using established protocols / question designs etc. Transparency about how normal processes have been accelerated and the consequent risks. Clarity about what 'good enough' research is in the context of a crisis.

4. Conclusion

The record-breaking unprecedented temperatures in more than 15 countries across Europe during the first week of 2023 reduced the demand for heating and provided some short-term relief from the surge in energy prices. Yet, estimating how long the crisis will last is unwise. Current predictions are that gas prices will remain high in Europe for years rather than weeks or months. If research does not capture learning in this period, society will have less information and analysis to guide responses to the ongoing and future energy crises. Policymakers seeking to protect vulnerable households and organisations by helping them to reduce their energy consumption and subsidising energy prices will not understand how best to do this.

The energy research community has a choice: either continue with current research projects and initiatives, or respond to the energy crisis by adapting priorities and approaches and working to overcome the various obstacles to conducting research in a hurry. Policymakers do not have the luxury of choice. The energy price crisis threatens the lives and livelihoods of millions of individuals, and the future of organisations, and policy makers must intervene to provide support where they can. The research community can play a crucial role in helping to inform and shape those interventions so they are targeted, cost efficient, and effective.

In a crisis, we argue for prioritising speed and undertaking 'good enough' research, using the approaches identified for reducing the risks inherent in that necessary acceleration.

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