Evaluation in an Emergency: assessing transformative energy policy amidst the climate crisis

1. Introduction

The need for transformative change and innovation in the energy system is becoming more urgent amidst the climate crisis. Governments must rapidly drive down carbon emissions in an increasingly complex system, and this comes with inherent risks. Failing to observe, share, and act on policy-based learning risks wasting public money and slowing the response to the climate emergency. Appropriate and timely evaluation can ameliorate these risks, helping to increase the pace and scale of innovation, accelerate energy policy-making, and improve delivery.

The practice of evaluating energy policy diverges around the world. In the US, evaluation is often formally incorporated into utility-led efficiency programmes, but requirements vary by state, between state and federal regulators, and between federal agencies. While cost-benefit analysis is typically required prior to the introduction of significant new regulations, evaluation of existing policies remains ad hoc. In the EU, energy policy evaluation has been criticised for being sporadic and inconsistent[1], while in the UK, a meta-review of innovation programmes found that evaluation findings were rarely incorporated into policy-design[2]. Recently, attention has been given to achieving *rigorous* energy policy evaluation[3]. However, we argue that the climate emergency generates a new context, with implications for how evaluators generate evidence and policy professionals[†] use it. In this commentary, we address the question: how can policy evaluation help accelerate energy system transformation in the context of the climate emergency?

In the next section, we outline in more detail the implications of the climate crisis for energy policy. In the remainder of the article, we address what these mean for evaluation practitioners and policy professionals, providing recommendations for the development of new methods and approaches. While this article refers to energy policy in its widest sense, the focus is on major innovation programmes involving aspects of development, demonstration and deployment. Often involving multiple technologies, new business models and citizen engagement, these interventions are increasing in number, and are critical for accelerating energy transitions. Beyond these, several recommendations which follow are pertinent for technology diffusion policies, include eco-labelling and efficiency standards.

2. Implications of the climate crisis for energy policy

Greater speed, complexity and wider scope are not only necessary in the context of the climate emergency, but are already emerging as significant trends in the energy transition.

Accelerating energy innovation requires scaling up investment in transformative energy solutions. Although growing by 5% from 2018 to 2019, the IEA claims public investment in energy innovation is not increasing rapidly enough[4]. As energy technologies become increasingly 'granular', energy innovation is being accelerated. Heat pumps, photo-voltaic cells, battery storage and appliances capable of load shifting have shorter diffusion and learning timescales than 'lumpier', capital intensive technologies. Their development and deployment is also being supported by energy policy aiming to accelerate the *decline* of fossil-fuel technologies[5].

[†] Throughout this commentary we refer to policy professionals, which encapsulates those civil servants and ministers involved in energy policy design, managing funding competitions and programme implementation. Evaluators are those tasked with monitoring, measuring, observing and assessing the success of policy interventions, including major innovation projects.

Digitalisation is increasing the speed of change and introducing new complexity[6]. The proliferation of connected devices into buildings, smart-cities and electricity grids is enabling more efficient use of energy, and offsetting the need for comparatively slow, costly infrastructure upgrades. Digitalisation is introducing new actors (flexible consumers, prosumers, technology firms, aggregators); markets (peer-to-peer trading), and governance processes (consumer protection and privacy regulations). With these come new dependencies and risks, such as the use of cellular networks by smart meters, or the involvement of non-domestic companies in implementing 5G communications technology, upon which the future energy system will rely (c.f. the US and UK's recent decision to exclude Chinese firm Huawei).

Building on extensive research on socio-technical transitions, there is increasing recognition amongst energy policy-makers of the need for whole-systems change, requiring interventions which go beyond techno-economic measures[7]. Increasingly ambitious, mission-oriented policy mixes are being developed which challenge the conventional divide between supply and demand side measures, as governments respond to trends such as decentralisation, flexibility and the involvement of new actors[8]. Regulators of the PJM and ISO-NE markets in the US, for example, recently incorporated energy efficiency into capacity market design, and in some countries, energy-only markets have allowed demand-side response to compete directly with supply-side technologies.

Increasingly, questions of social equity are being incorporated into conventional energy innovation programmes, as energy policy takes on wider scope. In the last decade, the EU has begun to address issues of energy poverty alongside clean energy innovation; while India is investing in rural solutions such as clean cooking and micro-solar projects alongside its Mission Innovation strategy[6]. These laudable moves add complexity by involving diverse actors, generating new contingencies, and broadening definitions of success.

As energy policy is beginning to reform in response to the climate emergency, these changes must be matched by equally ambitious scrutiny and evaluation.

3. New trends need new approaches: recommendations for evaluators

The climate emergency creates an imperative for evaluation approaches which: accelerate evidence generation and learning; assess multiple objectives for multiple audiences; utilise opportunities provided by digitalisation; acknowledge the limits of certainty in measuring complex change; and address broader audiences. We outline these five ways in which evaluators will need to adapt their approaches to energy policy evaluation.

First, the need for faster evidence generation and accelerated learning requires evaluators to make greater use of 'rapid assessment and evaluation methods' (REAM)[9]. While these are widely used in the development sector[10], they attract little attention beyond the international development community. Characteristics of REAM include setting clear and targeted objectives at programme outset; participation and interdisciplinary team-work; simultaneous collection and analysis of data; and the staged reporting of findings. These require front-loaded effort: consulting with funders and achieving buy-in from informants who will face competing demands during implementation phases. They also blur the distinction between evaluation and implementation, as interim findings are used to adapt and improve processes[8,10]. Given these complex demands, analysts emphasise the need for experience and expertise amongst evaluators[9]. For evaluators implementing REAM for energy policy evaluation, this implies a need to: a) increase senior staff deployment on project teams, securing trust with stakeholders and influence with funders; and b) involve a range of methods and technical experts, able to keep abreast of advances such as artificial intelligence in energy trading, as well as intersectional issues related to fuel poverty and health.

Second, as policy ambitions grow, concern for an equitable transition increases, and new actors enter the energy system, evaluators will need to go beyond assessing technical and economic performance of innovative technologies, to report against multiple objectives for diverse audiences. Whereas policy professionals and funders have conventionally sought evaluations which tell them 'what works'[11], evaluators will increasingly need to consider where, how, why, to what extent and for whom? For instance, the decentralisation of supply and the growing role for demand flexibility mean that evaluators can no longer consider individuals and local communities as *passive* users of technology and consumers of energy with a relatively narrow set of interests and needs, but as *active* agents of innovation - prosumers, community activists, investors - with multiple objectives. As ever, evaluators must be sensitive to questions of *access* to energy innovation, which is unevenly distributed according to socioeconomic factors such as income and housing tenancy. Additionally, digital capability and geographical location are increasingly dictating where and to whom the benefits of innovation accrue.

Third, while digitalisation enables greater scope for measurement and monitoring, it also places new demands on evaluators. Unable to collect all relevant data themselves, evaluators need to agree licencing 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, and require not only technical competences, but communications and persuasive skills. Additionally, data availability does not always correlate with significance. There is a danger that those aspects of innovation which can be quantified draw disproportionate attention compared with those relying on qualitative methods. Smart meters, for instance, produce high resolution data on energy consumption for domestic dwellings, informing policy professionals and grid operators about demand patterns. But they tell us little about energy *service* demand; and whether energy-using activities could be time-shifted, substituted or avoided entirely. Evaluators must combine methodologies and caution against the assumption that numbers paint the full picture.

Fourth, given increased speed and sociotechnical complexity, evaluators of energy innovation need to be more aware of, and more transparent about, the limitations of their work. For instance, whereas funders may seek *attribution,* evaluating *contribution* may be more appropriate[11]. This involves acknowledging the interactions between policy-mixes, the constraints of energy market design and broader socioeconomic trends. Just as elsewhere the IPCC has learned to carefully deploy language of *uncertainty* at the interface between climate science and policy, energy policy evaluators must increasingly caveat their findings when communicating with the policy community, industrial innovators and the wider public.

Related to their role as communicators, our fifth recommendation is for evaluators to do more to communicate the need for well-designed policy to bring about a rapid, just, energy transition, and report on policy successes. In the 2010s, the UK government withdrew and abolished a range of ambitious energy and climate policies, including standards for zero carbon homes and minimum carbon pricing. Seeking to stem rising energy costs, the Prime Minister was reported to have said 'get rid of all the green crap' (policy related costs). However, subsequent evidence showed these abandoned policies had saved householders considerably more money (in lower energy bills) than they had cost[12]. Progressive energy policy needs public support. While politics will always influence energy policy, evaluators can help to promote the value of effective energy and climate policies to public audiences. To do so will require some evaluators to develop outward-facing profiles and communications strategies.

4. Using and supporting evaluation effectively: recommendations for policy professionals

Consistent with widespread climate emergency declarations, there is an urgent need for energy policy to shift to crisis-response mode. We make five recommendations for policy-professionals to support and make more effective use of evaluations.

The first is simple: evaluations must be consistently incorporated into all energy policies. Meta-reviews highlight how most evaluations are programme-specific, achieving little impact on new policy-creation[2]. The climate emergency demands a more joined-up policy cycle so that learnings can be implemented rapidly. In the context of sociotechnical complexity and acknowledging the interactions of policy-mixes, the challenge for policy professionals is integrating insights horizontally, and aggregating these vertically to link individual programmes with government strategy. There is a need for more meta-evaluations, such as those undertaken by the European Commission[1].

Second, the aims and purpose of evaluations must be clearly stated when designing interventions. This includes accepting that attributing effects to causes is not always possible, and instead tasking evaluators with assessing impact in the wider context[11]. The trend towards increased speed means that energy innovation programmes are frequently launched before evaluation objectives and frameworks are fully scoped[2]. Whereas most frameworks focus on metrics for evaluating impact, policy professionals should identify *learning* objectives at this stage, envisioning how findings will be *used* by government, industry, communities and users. Mazzucato calls this 'policy as process', and highlights the central role of evaluation[8]. Within government, this means planning for how and when learnings will be integrated into future policy cycles, which are ideally transparent, well-structured, independent from electoral cycles and insulated from short-term political events. The use of evaluations can extend beyond individual programmes: evaluators can be tasked with assisting (and accelerating) the smooth revolution of the policy cycle, by extrapolating findings beyond individual policy programmes, and identifying synergies and trade-offs with other interventions.

Third, innovation funders should increase the value placed on formative evaluation and adaptive management, incorporating mechanisms for withdrawing investment and pivoting focus, or allocating additional resources to expand successful programmes. Given the significant investment of public money, there is a tendency for those involved in major innovation programmes to emphasise successes and downplay failures. Obstacles are rightly characterised as learning opportunities, but major scope changes can sometimes mean that core programme objectives are reinterpreted or even rewritten. The climate crisis demands that senior government decision-makers are willing to take difficult decisions, and this begins by affording evaluators a more fluid, autonomous role, and to be candid when presenting their findings. ARPA-E in the US provides an example of an agency which actively incorporates formative evaluation findings to rejuvenate its mission-oriented focus[8]. Unfortunately, as those overseeing policies also typically fund evaluations, there is a tendency for positive reporting bias by evaluators, keen to win follow-up work and future tenders.

Fourth, there is a need for guidance for policy-professionals reflecting the trends in transformative energy policy and evaluation practice outlined in the previous sections. This includes information on how to commission, implement and make use of rapid evaluation approaches. Unfortunately, the UK government's world-leading guide for policy evaluation, the Magenta Book, makes no mention of rapid methods in its 2020 revision. To overcome the barriers to accessing digital data, there is a need for new protocols and streamlined procedures to be put in place, which comply with protection legislation but expedite analysis. The Magenta Book warns against under-estimating the time taken to access data, but further detail is needed to enable policy professionals and evaluators to capitalise on the potential benefits of digital data.

Fifth, the climate emergency necessitates greater international collaboration on energy innovation amongst policy professionals, and evaluations can provide the means for knowledge exchange. 70% of total public spending on energy R&D is accounted for by just five countries: the US, China, Japan, France

and Germany[4]. Sharing evaluation evidence is crucial to ensure others' investment is targeted and efficient. Conventionally however, the primary driver for governments promoting energy innovation overseas has been the potential for export revenues. Trade missions are typically led by Departments for trade and industry with selected business representatives. Evaluations, when included, trend towards emphasising the economic benefits of technologies and business-models. Now there is a need for climate goals to supersede market drivers and for a new culture of knowledge exchange which acknowledges uncertainty (see section 3, final recommendation). In pursuit of global sustainability goals, evaluations can be used to share experiences internationally, without pressure to 'sell' benefits. International fora such as the Energy Evaluation Europe and Asia conferences are ideal meeting-places for evaluators, researchers and policy professionals. While growing in stature, they are attended largely by academics and consultants. Policy professionals should capitalise on these opportunities for knowledge exchange.

5. Conclusion

Although public investment in transformative energy solutions has grown only incrementally in recent years, energy policy is beginning to adopt an emergency footing, as trends such as decentralisation and digitalisation accelerate deployment and learning, and increased public and political concern about the climate crisis leads to more ambitious, cross-cutting programmes for energy system change.

Evaluation is crucial for guiding public investment and mitigating risks of policy failure, but the ways it is designed, implemented and used by policy professionals must be updated in light of the climate crisis. While rapid methods and adaptive management may blur the lines between policy-making, implementation and evaluation, greater willingness to withdraw and reallocate funding requires evaluators to retain independence and critical focus. This will be a difficult tension to manage. However, direct reporting from evaluators to senior government decision-makers above the level of programme managers should help overcome positive reporting bias. With greater complexity, multi-agency collaboration will become the norm: involving university researchers, energy agencies, and large and small consultancies will enable multiple perspectives to be voiced.

Responding to the climate emergency with evidence-based, equitable and far reaching energy policy has become a necessity, but is far from easy. Climate change is multifaceted and has myriad causes, and there can be no one-size-fits-all approach to climate and energy policy. Adaptive, responsive governance requires that the policy community adopts a philosophy of *continuous learning*. Thoughtful, timely and well-integrated evaluation is more important than ever. Our recommendations invite evaluators and policy professionals to reflect, review and respond, and we welcome ongoing debate.

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