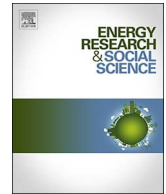




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Cosmopolitan, dynamic, and contested energy futures: Navigating the pluralities and polarities in the energy systems of tomorrow

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ABSTRACT

The futures of energy are cosmopolitan, dynamic, and full of contradictions. There are multiple actors and institutions with multiple aims and interests advancing the futures of energy; at the same time, these futures are envisioned differently and will, therefore, be produced and negotiated heterogeneously. This context highlights that energy futures are not free of cultural, political, and economic influence, and hence can be best-approached with cosmopolitan and plural lenses. This collection evidences plurality in terms of the disparate geographic locations, disciplinary foundations, conceptual frameworks, and methodological choices of our authors and their papers. This breadth points to the many roads of imagining the sociotechnicality of energy futures and of making these expectations real and durable. We suggest embracing plurality and reflexivity, and understanding the politics of energy futures, at the same time that we also issue a caveat on the complexity of these processes. Claiming no comprehensiveness or closure, our collective contributions should be taken as works-in-progress in the unending quest to understand, analyze, and critique the plurality of the futures of energy and the ways we imagine, navigate, and contest them.

1. Introduction

Energy—from its production to distribution to its use—has become a vital centerpiece in which contemporary societies order themselves and their institutions across local, national, and international scales [1]. These orderings, however, are in constant flux in the ongoing processes of change—processes that are either fluid or chaotic, depending on where one observes them and at what moment/s in time. The place and timing of energy transitions—the term that describes these processes, universally—are two of the most prominent themes in this journal.

Yet, the processes by which the futures of energy are imagined and produced, by whom, under what goals and circumstances, instrumentalities and mechanisms, and the moments at which they are contradicted and negotiated, and erased from or embedded within public discourse—all of these components are often under-studied and under-appreciated in the academic, business, and policy worlds. Accounts, stories, and narratives of these tensions and contradictions are important sites for engaging in the imagination and the production of both the futures of energy and the future of energy studies. These are also meaningful points of departure for academic, business, and policy analysis alike since they allow us to think about marginalized, yet

important, issues such as whose futures are at stake and whose futures need to be given premium in future scholarship and practices; in other words, the processes of energy transitions touch upon areas of justice, equity, democracy, sustainability, and fairness—ethos that are universally upheld as important in modern life (cf. [2–6]). While one may say that the entire journal itself is dedicated to these ends, there are but a few papers that rigorously take into account, analyze, and situate the social studies of energy with that of the futurity of energy.¹ This collection is an attempt not necessarily to address this gap but to expand and enrich the landscape by which we envisage and process these futures.

The study of the futures of energy from a social science perspective comes at a time when science is under constant attack [11–14], of a ‘post-truth’ world (see for examples a series curated and edited by Schiølin [15], and a special volume in this journal on post-truth politics and energy transitions), and of democracy under threat (see a series curated and edited by Simmet [16]). The dynamics in the politics, technologies, economics, and governance of energy are indeed moving fast.

Politically, many governments continue to advocate for continued reliance on fossil fuel systems using arguments that the transition

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¹ These, however, have already started appearing in the pages of this journal. Some examples of recent work on the futurity of energy include those by Bergman [7], Strenger and Nichols [8], and Raven [9]. Obviously, the inaugural paper that borne this journal also points to that sense of futurity [10].

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towards environmentally benign fuels would result in severe negative impacts on jobs and the economy (most notably by Trump's 'clean, beautiful coal' narrative²). This is despite overwhelming, if not universal, support for energy transitions in the context of decarbonization for climate mitigation and for sustainable development ends [18,19]. Nevertheless, present conditions seem to favor the transition towards sustainable energy futures. Technologically, for instance, we can observe advances in the junctions of mobility and energy, such as the push for electric cars [20–22]; although of course electric cars are not necessarily sustainable or environment-friendly, especially if they are powered by fossil-based energy systems. Policy-wise, we are seeing how, for example, the German *Energiewende*, the Chinese policy towards sustainable energy, and the Indian ambitious solar power targets are catching the imaginations not only of scholars but also of those working in policy and governments (e.g. [23]). Some examples are demonstrated in the goal of 100% renewable electricity generation in several Pacific economies, including the Cook Islands, Niue, Papua New Guinea, Samoa, Tokelau, Tuvalu, and Vanuatu.³ The market, too, is moving towards a favorable direction that brings energy transitions on track—e.g. the rapidly decreasing cost of renewable energy technologies [24], particularly of wind energy technology [25]. Institutions, both state and non-state, are also recognizing the transition as an imperative, and some have started updating and redesigning their structures and processes to accommodate this change (e.g. the Government of Thailand's Energy 4.0 where sustainable energy dominates future energy mix). Despite these realities, other institutional views of energy futures run counter with sustainable energy scenarios. The United States Department of Energy through its Energy Information Administration [26], for instance, projects that fossil fuels would still account for 77% of global energy use in 2040. Nonetheless, it can be argued that our imaginings of how aspects of energy systems' change interact with each other, and our understanding of how our current social orderings remain partial and uncertain at best and that their co-evolution with this change, are not at the same depth.

Each of us has their own visions, imaginations, dreams, predictions, anticipations, fabrications, and fantasies, even nightmares, with what the futures of energy may, can, and ought to look like (see for example Volume 31 in this journal on narratives including those by Moessi et al. [27] and Raven [9]) as well as in other outlets (in *Futures*, for example, about 1466 energy-related articles have explicitly mentioned the sense of futurity in their titles). Individually or collectively, it seems our fascination with the future is not easily satiated. We envisage what could be 'the' feasible, 'the' probable, 'the' plausible, and 'the' preferable futures for ourselves, our households, our communities, and our nations. We base these visions on our experiences, expertise, and biases, using different lenses—both fictional and logical. In short, these futures of energy are cultural, political, and economic—not just technological—and are exceedingly and inarguably value-laden. While there's nothing new in this claim (see [28]; cf. [29]), this acknowledgment and understanding opens up new challenges both in ways 'energy' is conceptually, theoretically, and empirically examined and studied, and practically in terms of designing and implementing new policy, market, and governance infrastructures, and interventions to meet the needs and ends of these highly-contested futures (cf. [10,6]).

Situated within these highly dynamic, yet integrated, interrelated, and interlinked, landscapes of energy technology-in-society, this volume presents the ways and approaches for envisaging and governing the futures of energy as their meanings and constitutions are continually changed, contested, and shaped—or in what, among others, Jasanoff [30] terms as the 'idiom of co-production,' Borup et al. [29] ascribe to as 'sociology of expectations,' and Stirling [31] calls 'culturing' of transformative change. We can also call these processes

'negotiating and navigating of futures.' The papers in this collection map and explore the myriad inquiries arising from these multiple dynamics. By electing to adopt a focus on 'energy and the future' (how energy systems would constitute life in the future) or the 'futures of energy' (where energy systems are at some time in the future) or, simply, 'energy futures,' this collection does not, in any way, stake a claim to be the first or the last issue on the topic either in this journal or elsewhere. The papers simply, yet collectively, show that a plural vision of the future of energy can be woven, and that our perceived current energy realities are not the only ones that we can fathom.

2. Negotiating and navigating multiple energy futures

The use of 'futures'—in the plural form—in this volume is intentional to cover the breadth of disciplines, approaches, concepts, theories, and methods we collectively offer to help us understand and analyze the varied and multiple dimensions of the practice and scholarship of navigating energy futures. Adopting this pluralist stance also allows us to capture the diverse narratives, stories, and discourses of futurity, which, by the same token, are also made and remade, produced and reproduced in multiple ways by multiple actors across multiple levels and spaces of inquiry and practices. The pluralities of these energy hetero-futures are, we concede, not easy to compact and compress under an overarching whole—which has never been our purpose anyway. Yet, it appears that while these futures are and can be imagined in multiple ways, few, if any, are capable of reaching a durable state [32]. As they are negotiated, minority futures are erased. In other words, only select futures are privileged to embed and dominate the community or the nation-state. This framing reverberates well with what Jasanoff and Kim [33] calls sociotechnical imaginaries, a concept that Jasanoff [34], in an edited volume [35], elucidates further. Sociotechnical imaginaries are 'collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology' (). Along similar plane, energy systems can also be considered 'works-in-progress' rather than static, immovable systems. Such dynamism—sociotechnical energy systems being in constant development (and re-development)—reverberates with some theorizations in international studies particularly with regards to the origins and subsequent trajectories of international norms, where 'norms' are conceived as 'processes' instead of as 'things' or as 'finished products' ([36]; cf. [37,38] on the processes of norm diffusion).

Apropos to Jasanoff's [34] framing and the ways that navigating energy futures are entangled in the webs of complexities and power relations, energy technologies and systems are also enmeshed in social connections and spatial identities [39,40] and in the dynamics of traditions, norms, interactions and practices [29]. Considering that energy systems are interdependent webs of socio-material or sociotechnical connections at play, imagining, navigating, or culturing their futures is never apolitical. The future will either reaffirm existing regimes or require resistance to explicate a required change. This social construction of energy systems means that human choices and user preferences will mark their designs, the appreciation of risks and benefits, and the individual and social behaviours they encourage, exclude or seek to regulate [41]. This understanding also reverberates within the sociology of expectations, where, applied in energy systems, the 'ideal' expectations of future energy users and the attributes of future energy systems are 'literally and materially scripted into' these energy socio-technical systems, 'though these will inevitably be reinterpreted and even subverted in usage' ([29]: 287–288). Social scientists, thus, has a role in advancing, rather than simply documenting, diverse energy futures.

As contested processes, navigating and negotiating energy futures imply understanding tensions between stability and change, between push and pull, that open up frictions and develop into struggles of

² A claim that has been debunked, see Farley et al. [17].

³ See these policies in <http://asiapacificenergy.org>.

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