BOOK REVIEW

Innovation in Energy Law and Technology: Dynamic Solutions for Energy Transitions, Donald Zillman, Martha Roggenkamp, Leroy Paddock and Lee Godden (eds) (2018), Oxford University Press, Oxford, 449pp., hardback £95, ISBN 978 0 19 882208 0

Innovation in Energy Law and Technology is a decent and solid book that achieves exactly what it aims to accomplish. I consider this to be both praise and (mild) criticism, as I explain below. Written by (mostly) academic lawyers with backgrounds in energy and environmental law, the book investigates 'how technological and legal innovation are transforming energy law' (p.2), particularly with regard to electricity production. It does this through four sections of thematically arranged standalone chapters: one on general relations between law and energy innovations (such as on climate change legislation and nationalist energy politics); one on leading-edge technological innovations that are either the result of legal incentives, or require updates of existing legislation (such as new nuclear reactor technology and electricity storage); one on the role of fossil fuel technologies in current energy transitions (such as unconventional gas and hydraulic fracking); and one on innovation at the level of the energy system (such as in smart grids and energy market reforms).

The editors have certainly ensured that this big book spans a wide range of energy law and technology issues and concerns. It offers a treasure trove of thoroughly analysed and well-written case studies that are a valuable resource for anyone interested in legal aspects of energy transition. With 23 chapters from 36 authors from 21 nations, one of the book's strengths is that it offers a diversity of legal perspectives. Another strength of the book is that it has a really global orientation. While Western countries form the bulk of the case studies, there are contributions from Brazil, Mexico, the Middle East, Russia and elsewhere, which makes for very interesting comparative reading.

Initially, I was reluctant to review the book, having no background in law myself (I am a philosopher). However, the book largely makes good on its promise that it should be important not only for lawyers, but also for policy-makers, economists and the general reader. While all chapters are on energy law and aimed at an academically schooled public, most take care to explain what is really important: what current energy laws do well, where their gaps or blind spots are, and what should be developed further in the light of ongoing technological innovation.

The added value of a book over a collection of journal articles is that it allows a reflection on trends, challenges and patterns in the individual studies. (Indeed, some of the chapters themselves are comparative studies, such as Chapter 8, which compares the budding hydrogen economy in the US with that of the EU.) Unfortunately, the editors tend to leave this as an exercise for the reader, though their conclusion does have a section on future directions for energy innovation, which focuses on issues such as multi-scalar law, new actors and responsibilities in the energy system and climate change as a driver for technology innovation. I would like to mention three recurring lessons I found particularly interesting as a philosopher.

First, ontology matters. Many technological innovations are distinct from tried-and-tested technologies, and often the law is poorly equipped to handle these. For example, are the transportable nuclear power plants in Chapter 6 nuclear reactors or nuclear vessels? Each is governed by very different laws. Should energy storage in Mexico in Chapter 10 be legally subsumed under energy generation, transmission, distribution or use? If Russia liberalizes its heat market to a lesser extent than its energy market in Chapter 12, how should it regulate its combined heat and power plants? Different choices can lead to very different outcomes, and lack of clarity about the legal status of new technologies can make investors reluctant to commit to urgently needed renewable energy projects.

Second, interdisciplinary collaborations are vital. While the book is written purely from the perspective of legal scholars, a recurring theme is the imbalance between legal and technological innovation. Often, promising new technologies enter a legal vacuum where a supportive regulatory environment is missing; and sometimes ambitious laws promote technologies that turn out to have problematic side effects. Chapter 11, for example, shows us that the Colombian energy laws that purport to be technologically neutral actually disadvantage new and innovative technologies over the *status quo*. A recommendation that the authors of the book do not arrive at, but that certainly would fit their observations, is that engineering students need to receive basic schooling in ethics, politics and history. This would enable them to discuss more confidently their work with policy-makers and the public at large, and so facilitate proper regulatory change.

Third, the free market needs to be strictly constrained in order to help achieve societal goals. Many countries studied in the book have liberalized their energy generation markets, usually with good results. However, it is abundantly clear that regulatory measures are needed to nudge this free market in desired climate-friendly directions, whether through carbon pricing, feed-in tariffs for renewables, tradeable green certificates or other measures. Speaking metaphorically, the free market in these chapters appears as a nuclear reactor: very powerful for driving innovation and lowering costs, but in need of clear command-and-control regulation. With climate change as a powerful driver of energy law innovation, the editors write that energy law has become more forward-looking. This is a welcome development. One philosophical criticism of free markets is that they do not take the preferences of future generations into account, generations which will suffer most from climate change.

There is one soot-covered elephant in the energy room that surprisingly receives only passing mention (in Chapter 17). This chapter discusses the difference between legitimate support for renewable energy technologies, such as feed-in tariffs, and measures that would count as state aid to a particular sector, and thus would be prohibited under international trade law. Along with many other chapters, Chapter 17 happily notes that renewable energy technologies have developed so far that they are now competitive in a free market environment, and that subsidies are no longer needed to bridge the price gap. However, Chapter 17 also mentions that in 2014, the EU spent more money on fossil fuel subsidies than on subsidies for renewable energy. Painting an even starker picture, Coady *et al.* (2017), using a generous definition of 'subsidy', find that worldwide fossil fuel subsidies amounted to over 5 trillion dollars in 2015, or 6.5% of global GDP. This staggering amount does make one wonder what it really means for renewable energy to be 'competitive', and how difficult it will be to get rid of fossil fuel-supporting regulations in a fair but quick way.

Finally, I would like to mention some differences in focus in the chapters. This is not to criticize the editors for failing to make the book even bigger; they have more than delivered on their promise. Rather, it is to reflect on some energy topics that receive little or no attention in this book, and the questions that they raise. Most chapters focus on the substantive contents of the legislation rather than on the process by which legislation was arrived at. Some interesting exceptions are Chapter 13, which describes how the US state of Colorado's strict methane control regulation was developed, and Chapter 16, which describes various legal alternatives that the Canadian province of Alberta had for phasing out coal and promoting renewables, which of these were chosen, and why. On the whole, however, the question of how good legislation should be developed and implemented falls outside the scope of this book.

More surprising to me was that energy justice and energy poverty receive relatively little attention, even though they are mentioned on the cover text. Energy transitions are costly, but the question of who will foot the bill is only really addressed in two chapters. In Chapter 14, South African plans are discussed for fracking in the Karoo, a biodiverse arid area, where legal uncertainties and the bypassing of parliament place local inhabitants and the environment at risk. In Chapter 22, failure to take energy justice into account in smart meter regulation in Australia led to concerns that the benefits would accrue to the industry, while private consumers would be saddled with the burdens. No chapter is primarily concerned with energy poverty, though national energy security

and combining a stable energy supply with an increased reliance on renewables are recurring themes. Evidently, the book's focus is more on nations or provinces than on particular (disadvantaged) groups within them.

Lastly, the chapters show big differences in critical reflection on the current energy system and its technical and legal aspects. Many authors follow the dominant 'techno-optimistic' paradigm – that, through technological innovation, we can solve the problems that we caused through earlier technological innovation, and that this should be facilitated by law as much as possible. Chapter 7, for example, criticizes regulation for nuclear reactors in the US that demands long-term proof of safety, available, of course, only for decades-old reactor designs. This effectively locks innovative reactor designs out of the market. The chapter stops short of asking such questions as: What could be alternative proofs of safety for such novel designs? How should regulation weigh different societal values against each other (theoretical safety, lack of practical experience, gains in reduced emissions)? And how can regulation adequately reflect the views and concerns of a public with divided views on nuclear energy? I particularly mention this case because the new types of reactors are called 'inherently safe' – a laudable design principle, but one that, for me, always calls to mind the 'unsinkable' Titanic.

Some chapters, however, do pay attention to the unintended effects of technological innovation and its (lack of) public acceptance. These provide deeper insights into the forces that shape regulation and are a welcome addition to the chapters about its effects. Chapter 11, for example, sympathetically describes the desire of Colombia to use coal-fired power plants for a more reliable electricity supply, but also its desire to mitigate climate change, and its awareness of the limits of carbon capture and storage technology to capture emissions. Or (again) Chapter 22, which shows how governments focusing on abstract climate change targets can easily overlook the very practical concerns of citizens – a strategy that never fails to backfire.

Chapter 22 is also the only one in the book that touches upon another elephant in the energy room – the reluctance of regulators to assess critically the value of electricity consumption patterns in addition to production patterns. It does so by investigating smart meters that were intended (but failed) to reduce and spread consumer energy consumption. Other chapters do mention energy efficiency measures, which can yield significant gains, but by and large regulators, and the authors of this book, seem to assume that all energy consumption is basically valuable because it implies GDP growth, and that we can meet climate change targets without curtailing it (except perhaps indirectly, through such measures as carbon pricing.) The authors of Chapter 21 do mention that the US has recently achieved a modest decoupling of economic growth from energy demand. This is certainly welcome, though it remains to be seen whether this is sufficient to achieve the massive emissions reductions necessary to prevent catastrophic climate change.

Innovation in Energy Law and Technology is a decent and solid book that achieves exactly what it aims to accomplish. Its cases are rich and varied and it offers thorough analyses of the many ways in which regulation can influence the energy system and *vice versa*. In doing so, however, it follows in the footsteps of regulators who seek to manage a transition in the energy system, yet by and large keep adhering to a techno-optimistic paradigm that would itself benefit from critical regulatory investigation.

Reference

Coady, D., Parry, I., Sears, L. and Shang, B. (2017) 'How large are global fossil fuel subsidies?', *World Development*, 91, pp.11–27.

Auke Pols
Knowledge, Technology and Innovation Group,
Wageningen University, The Netherlands
Auke.Pols@wur.nl