Accessibility statement

This is an accessibility statement for the journal: STS Encounters.

Conformance status

The Web Content Accessibility Guidelines (WCAG) defines requirements for designers and developers to improve accessibility for people with disabilities. It defines three levels of conformance: Level A, Level AA, and Level AAA. This statement is relevant for volume 15, number 1, 2023 and onwards. STS Encounters is partially conformant with WCAG 2.1 level AA. Partially conformant means that some parts of the content do not fully conform to the accessibility standard.

Feedback

We welcome your feedback on the accessibility of the journal. Please let us know if you encounter accessibility barriers. You can reach us at:

E-mail: imvko@cc.au.dk
Address: Helsingforsgade 14, 8200 Aarhus N

STS Encounters
Research papers from DASTS
Volume 18 • Issue 1 • 2026

Good energy
- valuation struggles over the energy transition

Julia Kirch Kirkegaard
Technical University of Denmark (DTU); Department of Technology, Management and Economics; Section for Human-Centred Innovation
https://orcid.org/0000-0001-9340-7202

Inaugural lecture: DTU Management, March 6th, 2025

STS Encounters is published by the Danish Association for Science and Technology Studies (DASTS). The aim of the journal is to publish high quality STS research, support collaboration in the Danish STS community and contribute to the recognition of Danish STS nationally and internationally.

ISSN: 1904-4372

Good energy
– valuation struggles over the energy transition

Julia Kirch Kirkegaard

Climate change and its consequences have led to calls for accelerating and upscaling renewable energy developments. Yet, these advances and changes to existing energy infrastructures often produce controversy and bring with them unforeseen consequences of their own. These controversies are tied to questions of what is 'good' and what counts as 'good energy'. Key to understanding this are the tools, devices, and expertise that have been used in the design of our energy future. After introducing the state-of-the-art on valuation struggles over the energy transition, the lecture sets out a new research direction, pointing towards a Critical Sociology for the Agencing and Devicing of Expertise to critically probe the (often invisible) role of expert devices in valuing what kind of energy future should come to count. Empirical examples used are wind energy, Power-to-X technology and energy islands. Julia Kirch Kirkegaard is Full Professor of Social Studies of Energy and focusses particularly on energy transition controversies.

Towards a study of 'Good energy'

I suppose it is the combination of my fortuitous jump into engineering combined with my natural nerdiness that has given me a particular curiosity and hunch for what on surface may seem like tiny technical details and artifacts. What *really* fascinates me in my work is how details of technological design can expose deeper societal controversies over *sustainability* and over *what is 'good energy'*. What I have discovered – after following the development of wind turbines, control systems and more in China, the US, and Denmark – is that it becomes possible to discover how technology and engineering science is co-producing the society we have today and shaping the one we will have tomorrow.

To explore this discovery, I argue we need to dive into the black box of design tools and devices. Such a focus on devices, technology, and *material matter* has been a core interest of the Actor-Network Theory-grounded (ANT) strand of Science and Technology Studies (STS) that I work within (e.g. Latour, 1983, 1987, 1992; Callon, 1984, 1986, 1991; Law, 1994). And it was through the lens of STS and its Social Studies of Markets that I became equipped to understand the apparent conundrum playing out in front of my eyes as I travelled across China in the early 2010s during my PhD study on China's wind power market.

To understand the impressive development in China but also to discover why and how so many wind turbines were failing and never even got connected to the power grid, I had to not only use my knowledge of Chinese language, culture, politics and economy, but also had to explore the nature of *algorithms* in a wind turbine's control system, digital software tools and simulation tools, standards and certifications (Kirkegaard, 2015; Kirkegaard, 2019; Kirkegaard and Çalişkan, 2018; Haakonsson, Kirkegaard, and Lema, 2020). Without an understanding of how turbine 'quality' – or, 'good' wind energy, if you will, is socio-materially construed and valued by engineers all the way down to a core algorithm that ensures the optimisation of *loads, aerodynamics, and control* (Kirkegaard 2015, 2018), I would have never understood the struggles unfolding in China, and in Sino-foreign R&D collaborations.

To make sense of the 'quality crisis' that was emerging in China's wind power market and ensuing controversy (Kirkegaard 2015, 2017, 2018), I had to educate myself, learning the language of engineers to the best of my abilities, to expose what I came to describe as "quality (and sustainability) by algorithm" (Kirkegaard, 2015, p. 440) or "algorithmic quality" (Kirkegaard, 2018, p. 10). Since then, I have, metaphorically speaking, been firmly 'sucked' into the 'control room' of engineers, and into their digital design tools and devices!

This experience profoundly changed my outlook on the world, and on how to conduct research. Maybe I also challenged some of my respondents and colleagues because I came to ask questions that are not necessarily expected from a 'softy' like me – a social scientist, a sociologist! Who am I to ask about electrons, control systems, models, algorithms?!

Indeed, when I joined the engineering-dominated Wind Energy Department at DTU almost 10 years ago, I did not fit the script assigned to me. That script was pretty much that of a social scientist brought in to look at 'social acceptance' and to solve the issue of 'local opposition' so the turbine designs being (co-)developed at the department could be deployed with minimal hindrance. This instrumental script never suited me, but with time and honest conversations, I came to appreciate the sometimes weird and challenging cross- or inter-disciplinary space between social science and engineering. Here, I got embroiled in struggles over the introduction of social science into a heavily engineering-based department, which in late 2020 resulted in the establishment of the section of Society, Market and Policy.

To manage my role at DTU Wind, I had to put on my STS-glasses and came to consider myself doing fieldwork in the 'laboratory' almost every day, whilst at the same time also actually being active part of the 'lab'. A challenging double-faced role: I am sure many of you can see the dilemma I faced. The field of STS started out more than four decades ago with social scientists and anthropologists entering the laboratories of scientists to study the production of knowledge, of new scientific facts. In my work at DTU Wind, I had to venture 'into the wild' of engineering, conducting ethnographic fieldwork on a daily basis. If anything, it is my close engagements with engineering that have constructed the kind of Social Studies of Energy – studying the making and unmaking of 'good energy' – that I, together with my growing group of young scholars, endeavour to undertake at DTU MAN.

Intermezzo – an ethnography

> It is one of my first days in my new postdoc position. It is spring 2015. I have just landed at Risø Campus, the Department of Wind Energy, in Roskilde. Inaugurated in 1958, it was established by the Danish physicist, Niels Bohr as 'The Research Establishment Risø', with a focus on nuclear energy. But in 1978, five young idealistic engineers embarked on what was to become the Danish wind energy adventure. At Risø, I have been employed to work on the Wind2050 project. This begs me to venture into a research field entirely new to me, namely that of 'social acceptance'. Made a 'non-issue' (inspired by Asdal 2015) in China and also not part of STS as such, I had never heard of this literature before. But I am excited to embark on fieldwork to speak to wind farm developers, community members, municipal planners and many more. I am eager to apply my STS lens of socio-technical market assemblages and controversy mapping. Yet, my new engineering colleagues expect me to develop a solution, a tool, to what they see as a barrier to developing wind farms.

*"*There must be a device we can develop to fix the problem*?", my new engineering colleague asks. I try to explain that I as an 'economic sociologist turned STS' am not trained in developing tools. Instead, I intend to conduct fieldwork to understand the issue.* "Fieldwork? Are you a farmer?" "No, not in that literal sense. I will go out, conduct interviews in the field and adopt a particular theoretical lens. Understanding the issue is paramount to actually solving anything". *"*But what do you mean by interviews? We don't use those here! And when you say theory, I think of Einstein's theory of relativity".

I am baffled by the difference in language, in methods, and theory. It seems like Don Quixote's impossible fight against wind turbines.

The overlooked role of expertise

It was during many such conversations that I came to appreciate how much our disciplinary training forms us and how much effort it takes to build a cross- or interdisciplinary language. As a former interpreter (in military Russian/Serbian), I took up the fight, though. What I uncovered during the years in the engineer's control-room was the overt and hidden valuations, and agency, of different forms of expertise in shaping our past, present, and future energy system – and the contestations they (inadvertently) co-produce. I also almost came to envy the powerful calculative devices developed and deployed by engineers to build and prove their 'facts'. Oh, the power of numbers!

And I also witnessed first-hand how the energy transition is governed as an expert issue, as a techno-economic 'problem' to be solved with more technical fixes. And so, expertise emerged as an issue in my early fieldwork, particularly as 'opposition' would often be framed as a discrepancy between 'facts' of 'experts' and 'irrational feelings' of local communities, the 'lay people'. This informed my project Co-Green (2021-2024) funded by Independent Research Fund Denmark (DFF) where we used the case of wind turbine noise to explore controversy in the energy transition. We argue that a tendency to frame the energy transition – and the issue of noise – as a purely techno-economic matter produces more controversy, more politicisation. We show this e.g. by diving into the different knowledges and ontologies of 'what is noise' (Kirkegaard, Cronin, Nyborg, and Frantzen, 2025). Noise, we show, is construed differently by expert knowledges, co-produced by their different instruments and devices for measuring and governing the noise source and impact on nearby residents (Kirkegaard et al., 2025; also see Solman, Kirkegaard, and Kloppenburg, 2023). Many of these devices and underlying metrics are however often unable to capture what noise is in its situational form of embodied experience for local residents (Kirkegaard et al., 2025; Kirkegaard, Frantzen, Nyborg, Cronin, forthcoming; Frantzen, Nyborg, and Kirkegaard, 2023; Frantzen, 2025; Solman et al., 2023).

With this emerged a budding *hypothesis* of mine that different forms of expertise are charged with different valuations of what and who should come to 'matter' or 'count' – or not – in the design of infrastructural transformations like the energy transition. Now, in my two new excellence projects – my Sapere Aude (2024-2028, DFF) and ERC projects (2024-2028, European Research Council) – the underlying *hypothesis* is that *expertise* plays an overlooked role in controversies over such societal transformations. Of particular interest is *if and how different valuations – be they of the economic, technical, social, environmental etc. – render particular forms of expertise with more or less agency on how the energy future is being imagined and orchestrated, and if and how particular expert instruments and devices partake in the devising and 'devicing' of our energy future in particular ways, and with particular consequences for whose valuations and concerns come to matter.*

This inquiry at the same time extends the call from social science energy scholars David Hess and Benjamin Sovacool (2020) for STS to contribute to the social study of energy by probing further into issues of justice, democracy, and sustainability. They argue that this may be exactly what STS can contribute with to the field; by diving into the "black boxes" of "expertise, knowledge, technology, and mobilized publics" (Hess and Sovacool, 2020, p. 14), we may display the *politics of design* (ibid., p. 2).

Yet, expertise is a slippery concept, and the literature on knowledge, disciplines, professions, and expertise is vast (e.g. Knorr-Cetina, 1997, 1999; Eyal, 2013; Abbott, 1988; Frandsen and Laage-Thomsen, 2020). Instead of rendering a full review of this rich literature, I wish to briefly define what I mean by expertise: I treat expertise as relational, a network effect, an outcome. Rather than found within one person, expertise is – in the perspective of the Sociology of Expertise – network assemblages of *actors, techniques, and devices* entangled in a particular politico-historical context, as laid out by Gil Eyal (2013, p. 864, building on Abbott, 1988, and Cambrosio et al., 1992).

Accordingly, key words in my research are those of *networks of expertise and devices* – and it also entails that it becomes possible to look out not only for those networks of expertise that have become 'entrenched' and powerful, but also those more 'alternative' or even 'marginalised' networks of expertise, even those of what is commonly termed 'the lay'. My interest here lies in whether and how expertise and devices in specific situations are *charged*, almost like an electrical charge, with particular *valuations*, another key word in my research – that carry agency. This also entails an interest in valuations of 'what is good' (taking inspiration from Kristin Asdal et al.'s notion of 'the good (bio)economy) (Asdal, Cointe, Hobæk, Reinertsen, Huse, Morsman, and Måløy, 2021). Indeed, if anything, goodness and sustainability are not given. It is situational and constructed. Let us go back to the case of failing Chinese wind turbines for a moment. What was seen purely as disastrous waste to the 'Western' eye was in China often seen as sustainable – as 'good' – in developmental terms, in terms of learning-by-failure for the future, with and through 'upgrading' with algorithms (see Kirkegaard, 2015, 2018).

'Good energy' for a Social Studies of Energy

This brings me to the Social Studies of Energy I endeavour to build together with my group at DTU MAN, the Section for Human-Centred Innovation. Here, we study the making and unmaking of what I intend to unfold today as 'good energy'. We are interested in understanding *by* and *for whom* and *what energy is made 'good', and with what consequences for whose energy future comes to matter*. What networks of expertise have been involved in the making and unmaking of particular forms of energy as 'good'?

Indeed, if we go back a century or two, coal-based thermal energy was construed as "good" – for growth, for welfare, made possible by experts on thermodynamics and engineering, and with time coupled closely to economics (also see Daggett, 2019; Mirowski, 1989; Fourcade, 2009; Berman and Hirschman, 2018; Hirschman and Berman, 2014, Berman, 2022).

But it did have a series of unforeseen consequences. The framing leaked, it overflowed with CO_2-emissions and climate change, as we well know, calling for the need to include alternative forms of expertise.

Wind power in Denmark was also construed as 'good' by many at the dawn of wind energy when entrepreneurs, idealists, and local communities formed wind energy cooperatives much in the spirit of the Danish priest and reformist Nikolaj Frederik Severin Grundtvig (1783-1872) (Kirkegaard, Cronin, Nyborg, and Karnøe, 2019). But incumbents in the power system saw wind energy as detrimental e.g. to system stability, the national budget, as 'bad' if you will (Karnøe and Kirkegaard, forthcoming; Karnøe, Kirkegaard, and Çalişkan, 2022). Since then, as I have shown in my historical study of the transformation of Denmark's wind power market assemblage, a 'paradigm shift' has been set in motion e.g. by shifting support schemes and technological optimisations (Karnøe and Kirkegaard, forthcoming; Kirkegaard et al., 2019; Kirkegaard, Nyborg, Georg, and Horst, 2023; Solman, Kirkegaard, Smits, van Vliet, and Bush, 2021).

This has been enabled by experts on wind energy engineering and energy economics. Behind the 'paradigm shift' and the continuous upscaling of wind turbines lies an underlying valuation of (cost)-efficiency and optimisation. A never satiated desire to drive down the cost of energy, harvesting as much energy out of the wind as possible. Such continuous optimisation – made possible by engineers always on the look-out to reduce waste and optimise the potential 'work' (also see Daggett, 2019) of the energy resource has made renewable energy cost-competitive against fossil fuels, enabling the energy transition to unfold in the fight against climate change. Meanwhile, the engineering ethos of efficiency, which so easily lends itself to economics where everything can be measured, calculated (also see e.g. Fourcade 2009), might sometimes lie at the very root of public controversy we witness today.

The new configuration of wind has overflowed e.g. because small-scale actors such as local cooperatives and communities were gradually ostracised from participation in the energy transition, co-producing controversy (Kirkegaard et al., 2019; Kirkegaard et al., 2023; Kirkegaard, Rudolph, Cronin, and Nyborg, 2022).

We can say that controversy over wind power is thus also the outcome of the dominance of particular valuations – of the techno-economic – at the expense of softer, more intangible, qualitative concerns and valuations. Indeed, what is the value and cost of transforming cherished landscapes, for instance? If you for instance look at the golden age pictures 'revised' recently by the energy company Andel, you may understand how and why it has caused a stir. Calculating the cost and value of these changes is not straightforward. Also, there's the question of how to calculate the value and cost of lost community cohesion in Denmark when locals struggle amongst themselves when it is revealed that their neighbour, a local landowner, has benefited financially from selling land to a wind farm developer, but at the expense of others – or you? (Kirkegaard et al., 2022; Kirkegaard, 2023). And what is the value and cost of the rural-urban split in Denmark playing out in the planning and development of renewable energy in Denmark? I have explored this in various papers with good colleagues (e.g. Rudolph and Kirkegaard, 2019; Kirkegaard et al., 2022; Kirkegaard et al., 2019, 2023).

The issue of renewable energy and its 'goodness' is currently being contested and negotiated in valuation struggles of many kinds. This engenders a question of whether and how there is space to value other things than the techno-economic in the energy transition? Is there space to include concerns and valuations of alternative networks of expertise – even of 'lay people' – for 'the social', democracy, for 'nature', the planet? Concerns and valuations which do not so easily render themselves calculable?

What is "good energy" in the first place? Who gets to decide? Is it affordable energy? Cost-efficient energy? Renewable, green energy? Community energy? Safe energy?

Such questions may run counter to conventional thinking about renewable energy since it is often framed discursively as intrinsically 'good'. With inspiration from Valuation Studies scholar Kristin Asdal and colleagues and their recent notion of "the good economy" (2021), one might say that the renewable energy economy has been made a 'good economy' since it is framed as [quote] "*innovative, sustainable, responsible and environmentally friendly* – in short, novel, ethical and good" (2021, p. 2). But as should be clear now, its goodness has become contested and negotiated. A Social Studies of Energy should ask how this has happened. The key question in my research is thus *how – and by and for whom and what – energy was made good, and with what consequences*?

State-of-the-art and new directions

And through all these questions runs an underlying question of 'what is value'?

With the long series of key questions just mentioned above, my research is rooted firmly in the Economic Sociology-infused STS strands of the Social Studies of Markets and Valuation Studies. They have as ambition to empirically trace value, its making and unmaking. Value is here not treated as *either* economic *value* (instantiated e.g. in the idea of a 'true' price equilibrium) *or* as subjective "*values*" we "hold" (Asdal and Huse, 2024, p. 32). Rather than speaking of 'value' as something that 'is', a lens of Valuation Studies (e.g. Helgesson and Muniesa, 2013; Muniesa, 2011; Stark, 2000, 2009; Asdal and Huse, 2024; Doganova and Karnøe, 2015) speaks of *valuation,* which denotes value as *practice.* Not as a noun but a verb. It is something that is constantly and socio-materially made, forged, construed, maintained (Çalişkan and Callon 2009, 2010; Geiger, 2021; Asdal and Huse, 2024; Callon, 1998); a "social practice where the value or values of something are established, assessed, negotiated, provoked, maintained, constructed, and/or contested" (Doganova et al., 2014).

Such processual and socio-material lens entails a radical break with the bifurcated notion of economic value versus social values, which has marked, and still marks, much of the scientific fields of economics and social sciences, hereunder economic sociology (for an account of this bifurcation e.g. see Stark, 2009, p. 5-6; Çalişkan and Callon, 2009). The bifurcation is said to originate in the so-called Parsons' Pact from the middle of the last century, a gentlemen's agreement on a division of labour between economics and sociology where economists were supposed to look at economic *value*, and sociologists on social *values* (Stark, 2009, p. 7-11; Hutter et al., 2015; Çalişkan and Callon, 2009). Out of this 'Pact' was born the field of New Economic Sociology where the economy was treated as something that is *embedded in* society (e.g. Granovetter, 1985). Later, as the field of STS emerged and moved out of scientific laboratories, economy and markets became empirical objects of inquiry also for sociologists and anthropologists, as demonstrably laid out by STS and ANT-scholar Michel Callon's performativity program in his edited book 'The Laws of the Markets' from 1998 (Callon, 1998; Muniesa, 2011; Çalişkan and Callon, 2009, 2010).

Founded in a 'pragmatics of valuation' of American pragmatism with roots in John Dewey's "Theory of Valuation" (1939), value here becomes an object of empirical investigation, "something to be grasped in its unfolding" (Asdal and Huse, 2024, p. 32). Here, value and values become fused in processes of valuation. And here, 'economy' and 'market' do not exist in a natural state; they must be socio-materially constructed. As has been forcefully demonstrated by the field of the Social Studies of Markets, and the sister literature of Valuation Studies, it takes hard work to render and transform things, tangible as well as intangible, into market commodities – into 'goods' (pun intended). Since then, valuable work has been done to shed light on the making of commodities, assets, resources, etc., and on how this requires the deployment of a host of market devices, which can help to make actors into calculative agents (Kirkegaard and Nyborg, 2021), associating the 'thing' with value and/or worth in a particular (and mostly calculable) way.

Take the sun and the wind. While in their natural state arguably a 'commons' (paraphrasing Ostrom's (2008) notion of 'the tragedy of the commons' (critiquing Hardin's (1968) rendition of it), they have over time been organised as market commodities for sale, while the land that the equipment stands on has become a lucrative asset held by landowners (Labussière and Nadaï, 2018; Birch and Muniesa, 2020; Nadaï and Cointe, 2020; Kirkegaard et al., 2023, Bauwens, Wade, and Burke, 2024). The making of the natural resource of the wind into a commodity has been enabled through meticulous expert work of particularly engineering and economics, and through the deployment of a variety of instruments and devices such as municipal zoning maps, the planning law, Wind Atlas metrics, Power Purchase Agreements (PPAs), digital twins, guidelines for the so-called 'good process' of public engagement (see e.g. Clausen, Rudolph, and Nyborg, 2021; Borch, Kirkegaard, and Nyborg, 2023; Kirkegaard et al., 2019, 2023), and much more.

These various devices equip investors to calculate the potential return on investment. The Social Studies of Markets has been good at exploring processes of economisation *particularly* in the shape of marketisation (Callon, 1998, and Çalişkan and Callon, 2009, 2010). Again, renewable energy is a good example. It has been marked by a large degree of market liberalisation within the past couple of decades (Karnøe et al., 2023; Kirkegaard et al., 2019; Grandclément and Nadaï, 2018; Karnøe and Kirkegaard, forthcoming; Kirkegaard et al., 2019; Christophers, 2022). Meanwhile, as public controversy is mounting around renewable energy, causing concern over delays and cancelled projects, the literature increasingly engages with how marketisation is not the only possible way to economise. Indeed, renewable energy could potentially be organised differently, in the shape of energy 'commons', a 'shared resource' (see e.g. Bauwens et al. 2024; Kirkegaard, Pallesen, Breslau, and Cronin, forthcoming).

Today's energy communities in the EU, and the Community Choice Aggregators in California that I and others have traced (e.g. Hess, 2011, 2019; Dokk-Smith, Kirkegaard, and Szulecki, 2022) may be instantiations of such attempts at 'commoning' (Linebaugh, 2008, Huron, 2015, Gibson-Graham, 2006; Fournier, 2013; Kirkegaard, Pallesen, Breslau, and Cronin, forthcoming) where concerns for local community ownership and local engagement become valuable and valued (Kirkegaard, Pallesen, Breslau, and Cronin, forthcoming). As concerns for local re-engagement and co-ownership surface, it becomes evident how energy economies are not purely a techno-economic matter, but rather a contested interface between "the economic" and "the non-economic", as also laid out by Asdal and Doganova in their special issue on 'the good economy' in the journal Valuation Studies (2025). The current state of the art of the Social Studies of Markets and Valuation Studies are currently engaged in a debate on how to refine our current understanding of markets as collective entities that are not purely economic (e.g. Coïnte and Asdal, 2025; Asdal and Huse, 2024; Geiger et al., 2025; Geiger, 2021; Callon, 2021; Frankel, Ossandón, and Pallesen, 2019). One such attempt is the recent notion of 'the good economy' (Asdal et al., 2021; Asdal and Huse, 2024; Asdal and Doganova, 2025), which denotes a 'double entendre' (Asdal and Doganova, 2025, p. 1) of the economic and non-economic where diverse perspectives and value measures exist, with clashes of values and morals (Geiger, 2021) (and to some extent a new attempt to account for how calculations are never just 'calculatively' 'economic', but also ridden with qualitative (e)valuations, or what Callon and Law (2005) have denoted the 'qualculative' (see also Çalişkan and Callon, 2010, p. 29)).

Towards a Social studies of energy in STS

This is the research agenda that I intend to take further in the Social Studies of Energy that I am pursuing. In exploring the controversy over what is 'good energy', I intend to trace how the controversy is constituted by valuation struggles over how to let the economic and non-economic come to matter, and how the economic is co-produced by particular networks of expertise and their techno-economic devices (e.g. Stark, 2009; Pallesen, 2016).

Combining the Sociology of Expertise (e.g. Eyal, 2013; Whatmore, 2009; Collins and Evans, 2007; Frandsen and Laage-Thomsen, 2020) with Valuation Studies (e.g. Helgesson & Muniesa, 2013; Muniesa, 2011; Lamont, 2012; Stark 2000, 2009) and the recent notion of The Good Economy (e.g. Asdal et al., 2021; Asdal and Huse, 2024; Doganova and Asdal, 2025), overlaid with insights from the Sociology of Expectations (e.g. Beckert and Bronk, 2019, Beckert and Ergen, 2020; Beckert, 2016; Ryan, 2025; Borup, Brown, Konrad, and Van Lente, 2006; Brown and Michael, 2003), I treat 'good energy' as an assemblage. A socio-technical *agencement* . It is an *outcome* – an effect – achieved in *processes* of *valuation* performed by those same networks of *expertise* and their "tools, equipment, technical devices, algorithms etc" (Callon 2005 in Hardie and MacKenzie, 2007, p. 58) mentioned before.

While the Social Studies of Markets has given plenty of attention to market devices which are in and of themselves "material and discursive assemblages" (Muniesa, Millo, and Callon, 2007, p. 2) that frame the situation, and with which actors 'cooperate' (Geiger et al., 2025, p. 7), we need to also give attention to what Asdal denotes as 'the little tools of valuation'. These may be maps, national politics, innovation strategies attached not just to market but also to "labs, production sites, parliaments, ministries, research councils, publics" (Asdal and Huse, 2024, p. 29).

In addition, what I want to promote is the idea that we also need to give increased attention to the often still 'missing masses' (paraphrasing Latour, 1992) of technical devices, that is, the hardware and software of energy transitions. We must pay attention to how these devices organise electrons, electromagnetic waves, molecules, and societies, co-producing and co-modifying energy-society relations as well as economy-technology relations in particular ways, and in particular sites.

Indeed, while the Social Studies of Markets have made invaluable contributions to our understanding of the role and agency of economic expertise, to understand energy and their multiple versions of economisation and marketisation, we must again revert attention to engineering (and other forms of) expertise, and how they co-modify energy and its valuation struggles (also see Coïnte and Asdal, 2025, p. 110, in their call to pay attention to how markets are not just designed and carried in the lab by "economists alone but are based on other forms of expertise as well"). This begs us to go back to the laboratories of scientists and engineers of early ANT studies, to study work on molecules and electrons, wires, and cables, and how they get co-modified by various forms of expertise.

I will unfold this perspective below through an account of my two current excellence projects. The two projects have strong synergies in their interest in valuations and expertise but differ in their respective focus on *agency and devices* as well as contributions to different literatures.

The Expertise of Expectations – the case of Power-to-X

Let me start with my Sapere Aude project funded by Independent Research Fund Denmark, called 'The expertise of expectations – the case of Power-to-X'. Here, I explore whether and how there might be what I coin an 'expertise of expectations'. Put bluntly: can we detect – much like a natural scientist identifying a 'molecule' or 'particle', a DNA string – something that can explain the relative 'agency', or 'power', if you will, of expertise, in mobilising support around an expected, an imagined technological future? For sure, there is no such isolated 'thing' to be found. Yet, I am curious to trace the *network effect* of expertise, its relative agency in terms of how it is sometimes capable – and sometimes not –- of mobilising and translating certain concerns and valuations into policy documents, modelling tools, funding instruments, investment decisions, and more.

Agency is thus meant as the ability to have an impact – an effect -– on the world and its unfolding, its translation (Callon, 1984), and on the mobilisation of support for an expected and imagined future. Building on my initial hypothesis that *expertise is imbued with particular but often hidden valuations* that (e)valuatively charge technological expectations with a moral of what is 'good' and desired futured, it becomes important to trace networks of expertise and their potential agencies as this may have an effect on our energy future. This in turn raises 'moral' and ethical questions of what are 'desirable' or 'good' futures, and for whom and for what? It makes critique possible.

We use the topical case of Power-to-X technology, or PtX, which has made it forcefully from laboratories into the decision-making rooms of policymakers in Denmark, the EU, and globally. Evidently, some networks of expertise gained agency here, but how? PtX denotes what many call a hype of the well-known, old technology of electrolysis, which is the use of electricity to split water into its two constituent ingredients – hydrogen and oxygen. Today, it is branded as a 'good economy' because it is 'green' in the sense that it is powered by electricity from renewable energy.

But what is the value of 'x' in PtX? The notion of 'x' is used as a semiotic sign, an attractor: 'x' signifies the open-ended possibilities and futures (Dalsgaard and Kirkegaard, 2025). The 'x' may be constituted as "green hydrogen", but it could also be coupled with other molecules – most notably CO_2 – to form green e-fuels for use in aviation and heavy transport, or green fertilisers in agriculture. The expectations for this technological future are gigantic, as PtX offers hope for sector-coupling that can decarbonise hard-to-abate sectors (European Commission, 2020).

It also offers hope to some that we can continue to travel and fly – and our children and grandchildren, too – in the future, without bad climate conscience (see e.g. Prime Minister Mette Frederiksen's new year speech from 2022, www.stm.dk). As an example, a graph was made by the Danish Energy Agency in 2022, to help forecasting of the budding PtX market.

It illustrates Denmark's expected growth in electricity demand. Here, you can see the expectation that PtX in 2050 will consume four times as much electricity as the whole of Denmark consumes today (Danish Energy Agency 2023). This is a powerful expectation with potentially dramatic consequences for our energy system, energy landscapes, and more.

Just imagine all the wind turbines and solar panels that need to be set up to make this happen, as well as the cables and market interconnectors that are required. The graph has already had great agency, traveling around research institutions, companies, government, promoting and enacting a particular vision of the future. Yet, multiple concerns are already rising over PtX, e.g. over losses when the energy of electrons is converted into molecules, over expensive cable infrastructures and the risks of leaking gas molecules, the rising demand for electricity and imbued expectations of growth and business-as-usual scenarios, as well as the use of resources such as CO_2, land, and water, the waste of heat and oxygen, and safety concerns due to risk of explosion. Further, PtX requires heavy investment into infrastructures, making the PtX economy costly and contested. Who should pay? The private or public? The national budget, or EU? The various concerns and unsettled distribution of risks and costs have made investors – both public and private more hesitant, and it remains to be seen *how* and *whether* PtX will become a dominant part of our energy future.

I use the notion '*agencies of expertise',* or even *practices of agencing,* to understand how certain expectations to PtX come to matter and count, and others not, probing the valuation struggles and morals of an expected energy future, and inquiring into the potential for re-agencing (Callon, 2021) so that the agencement gets re-formatted (Callon, 2021; see Cochoy, Trompette, and Araujo, 2016). Interestingly, the idea of green hydrogen is not new. At Risø Campus of DTU's Department of Wind and Energy Systems, there is a picture of Poul La Cour (1846-1908) – father of today's dominant wind turbine design – who lived in the late eighteen hundreds, and who experimented with the use of electricity from wind to conduct electrolysis.

Apparently, he did not have the devices to mobilise support and translate a powerful network of expertise back then. It remains to be seen if it is feasible today.

'Good-by-Devicing – probing how value comes to matter'

My Sapere Aude project ties into my project *'Good-by-Devicing – probing how value comes to matter'* funded by the European Research Council (ERC). Here, I zoom in on the role of devices in designing the energy transition, using the case of energy islands. Combining the lenses of Valuation Studies and the Sociology of Expertise with the notion 'good (energy island) economy', I coin and probe the core concept "devicing" as a way to shed light on what is 'the good energy island'.

Devicing – with the conscious misspelling with C – is my new way of examining how important decision-making tools and devices orchestrate transitions, often invisibly. It is a matter of taking materiality in the sense of technological hardware and software more firmly back into the social studies of markets and their valuation.

Devices (e.g. Callon et al., 2007; Geiger et al., 2025; Hardie and MacKenzie, 2007)– e.g. Power Purchase Agreements, Wind Atlas figures, circuit breakers, tools for calculating energy scenarios, software for simulating power flow, or contracts for selling electricity – do more than provide numbers. They act – perform things according to values inscribed in them, *devising* (McFall, 2014) values in the sense of inventing them. They partake socio-materially in market-shaping, in *devicing*, as they *orchestrate* or '*design*' our energy system infrastructure and energy future. Looking at devices as design objects (Geiger et al., 2025, p. 11, 20), and markets not only as the result of strategic action, but also of "deliberate shaping, engineering or design efforts by diverse market actors" (Geiger et al., 2025, p. 8), there may be room for experimenting with the potential for reconfiguring ethical and moral infrastructures (Geiger et al., 2025) by devicing differently.

By opening up the black box of how such devices work, we open up for the potential of *re-devicing,* orchestrating transitions 'otherwise' (paraphrasing Woolgar & Lezaun, 2013).

We use the case of energy islands to shed light on how the emergent energy island economy is framed and deviced as 'good' in particular ways and in particular sites, and how it may produce controversy. Energy islands are central to the engineering vision of a new optimised meshed electricity grid, which can transport unprecedented amounts of renewable energy over long distances and across national borders. Key to this is the shift from today's dominating Alternating Current (AC) to Direct Current (DC). While Thomas Edison (1847-1931) promoted the DC nearly 150 years ago in the so-called 'war of the currents', its potential return to the scene in the context of energy islands comes with a power that Edison could never dream of. It comes at high voltage, at 400,000 volts. Today's energy island concept relies on innovations of so-called HVDC (high voltage direct current) cables.

These in turn rely on power electronics, precise control systems, and high power circuit breakers. The HVDC network and energy islands as such constitute what some term a 'Mars mission' for the energy system (DTU & AAU, 2021), since it reconfigures and integrates our energy system in a completely new way. Inscribed into the 2020 climate law, Denmark plans to construct two energy islands, one artificial in the North Sea, and one constructed on the natural island of Bornholm (Danish Ministry of Climate, 2021). The power from the Baltic Energy island on and around Bornholm, for instance, is proposed to feed Germany (and, who knows, maybe Poland and Sweden, too) with green energy. Energy islands are thus not only a Danish vision, but increasingly also a European one, because an essential facet of energy islands is that they interconnect the electrical power systems of various EU countries in a cost-efficient way.

So, what is being valued here? What is the value of energy island? Of energy transition for that matter? Through the device of, for example, HVDC cables and the device of hydrogen pipelines, via PtX, energy islands are being construed as 'good' in terms of cost-efficiency as they reduce losses and waste. They are also 'good' in the sense of decarbonising Europe, helping to ensure energy independence, enhance energy security, and improve European competitiveness through lower electricity prices: the basis of the Draghi-report (2024). These particular valuations of 'the good' are construed by entrenched networks of expertise, and their devices, simulating power flows and energy markets. Concerns of various kinds are, however, being raised, e.g. over safety and security.

An HVDC system might be sensitive. It requires ultra-precise control systems, digital systems for monitoring power flows, and most critically, advanced DC circuit breakers that can interrupt current at full flow: a challenge when, unlike AC, there is no zero-point to provide a natural time to open a breaker. Concerns are mounting over the risk of black-outs and cyber-attacks, and its entanglement with geopolitics, and that Europe is lagging behind in the area of innovations necessary to make meshed grids a reality.

Let's take a last example of a powerful device used in the construction of a good energy island economy, namely that of procurement schemes for developing large-scale offshore wind energy: When the state wants wind power capacity, it invites companies to compete and meet certain qualifications. So far, the main criterion has been the lowest price assessed by a formula expressed as a matter of levelised cost of energy, the LCOE. This reflects the valuation of cost-efficiency (also see Kirkegaard et al., 2023; Kirkegaard et al., 2019; Ossandon, Pallesen, Karnøe, Georg, 2025). Yet, a number of other networks of expertise have not been included. They contest the cost-efficiency valuation, raising concerns for things like sustainability, biodiversity, equity, safety, democracy. Indeed, at the moment critical voices are rising, making it uncertain *whether* and *how* energy islands will ever materialise.

This is also because of contestations over how to calculate costs and value from the energy islands. Are we calculating costs and value within or beyond Danish borders?

Within a short project timeframe or a long timeframe? Do we see value in monetary terms only, or could there be spillovers e.g. in socio-economic terms, for innovation? And do we expect the energy transition to be cost-neutral, or should we – as nations, as tax-payers – allow it to cost? And should Denmark pay for them alone, or should the EU chip in?

All these valuation struggles play out in heated debates on how to make a proper 'distribution key' for costs and value-creation across EU countries. These negotiations unfold not only in research laboratories, bureaucratic agencies, ministries of climate, energy, environment, but even defence . And in the midst of it all, the energy island in the Baltic Sea – Bornholm and its around 40,000 inhabitants were never part of the initial design or calculations. This type of top-down planning and design has (almost inevitably) provoked local protest movements as well as activating counter-valuations to "make energy islands a success" (Energy Island Forum, 2024). The regional municipality and other proponents of the energy islands are also trying to value the potential socio-economic value of the energy island. But it is hard to quantify the innovation spillovers, the socio-economic value accrued to local society, so they are easily discarded or marginalised. And so, energy islands and their future are uncertain. They are currently put on hold.

So, what does it take to 'make energy islands a success'? Can networks of expertise be reconfigured to include broader valuations and concerns for 'the social', 'nature', for 'innovation spillovers'? New connections, wires, and lines must be drawn, and new calculations must be made to demonstrate the value of the energy islands, on a local, national, and European scale.

This requires various instruments and devices to make experts, and others, capable of calculation and evaluation equipping them to become calculative agents capable of making sound investment decisions for the short and long term. And it might require the reconfiguration of networks of expertise so their devices can include broader valuations and concerns than at present, such as the state of the future global climate (see Doganova, 2024, on the role of discount rates to discount the future), energy justice (Jenkins et al., 2016), and more.

This requires researchers to venture into the black box of devices. By taking technical devices seriously, I apply *devicing* – with a C – in a strong version, in a sense taking Bruno Latour's dictum that 'technology is society made durable' (1990) to a new level.

Methods - re-devicing as intervention

Energy islands and PtX technologies constitute two examples of valuation struggles over what today counts, or could come to count, as 'good energy' and 'good energy futures'. Diving into the agency of expertise, its devices and devicings and imbued valuations, renders the space where energy transitions are envisioned, mapped, and orchestrated open for ethnographic inquiry and for experimenting with how things 'could be otherwise'.

In both projects, we start out in the past, following document movements (Asdal and Reinertsen, 2022) and engaging with networks of expertise that have been involved in the construction of expected energy futures, examining how and by whom PtX and energy islands were shaped. Only then we can understand current valuation struggles before engaging with re-devicing for the future. That is, we are on the lookout to discover potential opportune moments for intervention in valuation processes, *in* and *through* intervention *with* the devices.

In the last part of both projects, we enter the control-room to experiment with inventive methods for enhanced public engagement where the key notion is "re-devicing": Can transitions be 'better' or orchestrated differently? This is where the big high-risk, high-gain aspect of the projects lie. In the final co-production workshop of the ERC-project, we work with a selected key device or two and experiment with the inclusion of otherwise marginalised valuations and concerns that are less tangible, less settled and stabilised, and more 'qualitative'. To do this, we invite in a broader range of actors, including both 'entrenched' and 'alternative' networks of expertise. Such experimentation with key devices has not been done before.

What will happen when we experiment with valuing differently? And where are the limits for what can be (re)deviced?

Contributions and pointing forward

Summing up, my two current excellence projects promote a research agenda that I term a *Critical Sociology for the Agencing and Devicing of Expertise*. In the following, I will briefly mention three main contributions.

Into the design phase – contributing to Social Acceptance

First, by venturing into the design phase where design tools and devices are made, I contribute to the extant literature on Social Acceptance, which has focused on local opposition to renewables in the planning and development phases (e.g. Aitken, 2010; Devine-Wright and Howes, 2010; Wüstenhagen et al., 2007). Yet, since most solutions have reached a stalemate, I argue that there is merit in searching for opportune moments to include otherwise excluded valuations and concerns much earlier. That is, in what I coin the 'early design phase', or pre-design – in the devices – so that more diverse voices are heard. Expert devices and their valuations have been overlooked in this literature. It is my hope that my research can help reveal some of the exclusion processes that take place *in* devices, long before public consultations (also see Kirkegaard, Rudolph, Nyborg, Solman, Gill, Hallisey, and Cronin, 2023), and their hidden dynamics of power (see calls for a critical approach in social acceptance studies, Batel and Rudolph, 2021; Ellis, Schneider, and, Wüstenhagen, 2023) e.g. through engagement with Valuation Studies (e.g. Frantzen, 2025).

Agencies of expertise – contributing to sociology of expectations

Second, I contribute to the extant literature on the sociology of expectations. This literature has described in great detail how expectations for the future have agency to shape how the future is enacted (e.g. van Lente and Rip, 1998; Brown et al., 2000; Borup et al., 2006, Beckert 2016). While the extant literature has engaged with the agency of expectations to organise future-oriented action, relatively little attention has been given to the role of expertise in shaping the emergence, dynamics, and maintenance of expectations (but see Beckert and Ergen, 2020; Pollock and Williams, 2010; Budde and Konrad, 2019), as well as to *how* expectations are translated into specific policymaking, energy scenarios, or funding actions. By treating issues of expertise and (e)valuations *in unison* rather than in isolation, my research examines the (potential) agency – and power – of expertise. I do this by inquiring into how different forms of expertise (e)valuatively charge an expected future with (different) value(s), and the inherent politics.

STS – ethics and public engagement

Finally, I contribute to STS. *Firstly*, I endeavour to engage with a more interventionist approach than most studies in the social studies of markets and valuation studies have done. Indeed, if anything, this literature came out of the realisation that theory is performative, so of course it begs critical reflexivity when we experiment not only with the performative role of theories and instruments but also of our own social science experimentations (Ossandón and Pallesen, 2025; Ossandon and Onto, 2022; Eyal and Buchholz, 2010; Coïnte and Asdal, 2025, p. 111).

Secondly, my research agenda encourages critical reflection and engagement with the politics and power – and entangled morals – imbued in devices and deployed by different networks of expertise. The future being a political domain where actors struggle to acquire the power to act, intervention in devices to re-orchestrate for an *as if* future constitutes a political space itself. It necessitates the development of new methods for enhanced research ethics, reflexively engaging with what future we ourselves promote; "new ways of 'thinking futures'" (Ryan, 2025, p. 455; also see Geiger et al., 2025).

In a space of energy islands and PtX where local planning and politics intermingle with geopolitics, and with proliferation of multifarious concerns and calls for accelerated upscaling of the energy transition, the question is how one is to decide which devices to set up, and who to involve in doing this (Callon, 2021, p. 404), and also to find out how politics – a politics with little p – gets enmeshed with 'the Political', i.e. a Politics with "Capital P" (Geiger et al., 2025: 11, drawing on Mouffe , 2011) "'of what markets we want'" (Kjellberg, 2021; Kjellberg, 2025 in Geiger at al., 2025, p. 11).

Thirdly, my research agenda responds to calls for more acknowledgement of the emplaced nature (Geiger et al., 2025, p. 7) of "concerned [energy] markets" (Geiger, Harrison, Kjellberg, and Mallard, 2025) that require the socio-material work of insertion into specific sites (Asdal and Huse, 2024; Labussière, Banos, Fontaine, Verdeil, and Nadaï, 2018) and into specific materialities. Energy transitions and renewable energy markets are emplaced processes.

No wind farm, solar park, energy park, etc. can be materialised without land or a seabed. But space is imbued with valuations as well. We need to understand how 'good' energy economies in response to "collective concerns" (Frankel, Ossandón, and Pallesen, 2019) of climate change are inserted into space, sometimes creating new concerns of an ethical and moral character. This begs enhanced dialogue with critical geography (e.g. Bridge, 2009; Kuchler and Bridge, 2018; Kama, 2015; Nadaï and Labussière, 2018) to ask how 'good' energy 'sites' and 'landscapes' are shaped to fit the good energy transition economy, but also with anthropological approaches to studying energy (e.g. Abram, 2020; Abram, Winthereik, and Yarrow, 2020). A dialogue that is already on the way with recent calls to inquire more into questions related to local planning (Ossandón, 2024; Asdal and Huse, 2024).

Looking beyond

Approaching the end of my lecture, this takes us back to the initial question of *what is good energy*? And, relatedly, *what is the value of energy transition*, or, more fundamentally *what is the value of value?* Indeed, there are many 'good *energies',* or what the new notion of stacked economisation (Çalişkan, MacKenzie, and Callon 2024) may treat as stacking of good (energy) economies. The many versions of energy economisation engender variable and contested energy ontologies and the need to inquire further into 'the value of value', which may reside in as of yet unrealised potentials (Dalsgaard and Kirkegaard, forthcoming).

The Social Studies of Energy I wish to promote is hence not tied only to the value of energy transition, but also to the value of other forms of energy, e.g. of nuclear, biogas, carbon capture, utilisation and storage (CCUS), energy-consuming data centres, or even mining for rare earth metals. The multiple valuations and good energy economies entail that we must dive deep into the complexities and politics of energy– and economy relations (also see Barry, 2013), using this as a prism to shed new light on how they get entangled in *particular* versions of 'the good', and how they at times become morally contested as so, and examining the potential role of expert (and other) knowledges in this.

Much like the Danish physicist HC Ørsted was concerned with electromagnetism, and Thomas Edison with the currents of electricity, I argue strongly that a Social Studies of Energy founded in STS must take the subject matter seriously, its materiality, and its devicings: the electrons, molecules, currents, circuit breakers, control systems, simulation algorithms, digital twins, energy scenarios, and procurement schemes, wires, to name but a few. In promoting a return of the 'missing masses' (Latour, 1992), we need to take seriously the co-modification of economy and energy (much like Asdal and Huse's (2024, p. 6-8) notion of the co-modification of economy and nature), of economy-electron relations, in particular sites, and with particular consequences.

On a mission to bring technology back into the centre of analysis of markets and economy, I suggest more reflexivity of not only what concerns valuation devices include, but particularly *also* what they, sometimes inadvertently, overlook and exclude. What are the (moral) consequences for what and whose energy future comes to count? And what are the consequences for the valuation struggles we see unfold? And how are we to take care of those (mostly qualitative) valuations and concerns that refuse translation into design tools and devices?

Is it worth the translation? I believe it is worth the attempt. It is worth it for a more 'just' and climate-caring energy future.
So let me end by going back to my first days at DTU. Taken aback by the need for translation between different forms of expertise, I came to appreciate – at least over time, I did – how I could continue my nerdy interest in exotic languages. This time it was not Russian, Serbian, or Mandarin, but what I term 'interdisciplinarian'. And now more than ever, in the current geopolitical climate, my language skills and interest in translations – across languages, cultures and disciplines – are essential as we cannot conceive of energy islands, PtX or any other energy without an international understanding in today's geopolitical climate. It is time for further cross-fertilisation of Valuation Studies with anthropology, critical geography, political science.

With that, we have come to this milestone on my journey: the end of my inaugural lecture. I am thrilled to have landed at the Department of Technology, Management and Economics (DTU MAN), where I will continue my curiosity about energy-society relations. With a vibrant STS environment with space for conducting ground-breaking, basic research, I and my group have a whole new laboratory to work with and experiment with, to extend the dialogue across the various forms of expertise we have present in the department. Let's go re-devicing and develop new methods for what may be a new wave of '*critical proximity with technology*' (Latour, 2005 in Munk, 2022).

Bio

Julia Kirch Kirkegaard is professor of STS (Social Studies of Energy) at the Technical University of Denmark (DTU). She leads two excellence grants funded by the European Research Council (ERC) and Independent Research Fund Denmark. As an economic sociologist founded in STS and particularly Valuation Studies, and with previous employments at Stanford University and Copenhagen Business School, her research examines valuation struggles over the energy transition, looking at what 'sustainability' or 'good' energy is, and how they are entangled in controversies over knowledge and expertise.

References

Abram, S. (2018). Electricity – Electricity as a Field for Anthropological Theorising and Research. Chapter 38 in M. H. Bruun, A. Wahlberg, R. Douglas-Jones, C. Hasse, K. Hoeyer, D. B. Kristensen, and B. R. Winthereik (Eds.), *Handbook of the Anthropology of Technology* (pp. 741-756). Singapore: Palgrave Macmillan/Springer Nature Singapore.

Abram, S., Winthereik, B. R., and Yarrow, T. (Eds.) (2020). *Electrifying Anthropology - Exploring Electrical Practices and Infrastructures*. New York: Routledge.

Aitken, M. (2010). Why we still don't understand the social aspects of wind power: A critique of key assumptions within the literature. *Energy Policy, 38*(4), 1834-1841. https://doi.org/10.1016/j.enpol.2009.11.060

Asdal, K. (2015). What is the issue? The transformative capacity of documents. *Distinktion: Scandinavian Journal of Social Theory*, *16*(1), 74-90. https://doi.org/10.1080/1600910X.2015.1022194

Asdal, K., Cointe, B., Hobæk, B., Reinertsen, H., Huse, T., Morsman, S. R., & Måløy, T. (2021). 'The good economy': a conceptual and empirical move for investigating how economies and versions of the good are entangled. *BioSocieties*, https://doi.org/10.1057/s41292-021-00245-5

Asdal, K. and Huse, T. (2024). *Nature-made economy – cod, capital and the great economization of the ocean.* Cambridge, Massachusetts: The MIT Press.

Asdal, K. and Doganova, L. (2025). Valuation and Critique in "The Good Economy". Theme issue editorial, Part 1, *Valuation Studies*, *12*(1), 1-15. https://doi.org/10.3384/VS.2001-5992.2025.12.1.1-15.

Asdal, K. and Reinertsen, H. (2022). *Doing Document Analysis - A Practice-Oriented Method*. London: Sage Publishing.

Barry, A. (2013). *Material Politics – Disputes Along the Pipeline.* New Jersey: John Wiley & Sons.

Batel, S. and Rudolph, D. (2021). A Critical Approach to the Social Acceptance of Renewable Energy Infrastructures. In S. Batel & D. Rudolph (Eds.), *A critical approach to the social acceptance of renewable energy infrastructures* (pp. 3-19). Springer International Publishing. https://doi.org/10.1007/978-3-030-73699-6_1

Bauwens, T., Wade, R., and Burke, M. (2024). The energy commons: A systematic review, paradoxes, and ways forward. *Energy Research & Social Science, 118*(103776), 1-16. https://doi.org/10.1016/j.erss.2024.103776

Beckert, J. and Bronk, R. (2019). Uncertain Futures – Imaginaries, Narratives, and Calculative Technologies. *MPIfG Discussion Paper, 19*(10). Cologne: Max Planck Institute for the Study of Societies.

Beckert, J. (2016). *Imagined futures: Fictional expectations and capitalist dynamics*. Cambridge, Massachusetts: Harvard University Press.

Beckert, J. and Ergen, T. (2020). Transcending history's heavy hand: The future in economic action. *MPIfG Discussion Paper*, 20(3). Cologne: Max Planck Institute for the Study of Societies, https://hdl.handle.net/21.11116/0000-0005-E443-E.

Berman, E. P. (2022). *Thinking like an Economist – How Efficiency Replaced Equality in U.S. Public Policy*. Oxford: Princeton University Press.

Berman, E. P. N. and Hirschman, D. (2018). The sociology of quantification: Where are we now? *Contemporary Sociology, 47*(3), 257-266, doi: 10.1177/0094306118767649.

Birch, K. and Muniesa, F. (Eds.) (2020). *Assetization: Turning Things into Assets in Technoscientific Capitalism*. The MIT Press, https://doi.org/10.7551/mitpress/12075.001.0001

Borch, K., Kirkegaard, J. K., Nyborg, S. (2023). Three Wind Farm Developments, Three Different Planning Difficulties: Cases from Denmark. *Energies*, http://dx.doi.org/10.20944/preprints202304.1248.v1

Borup, M., Brown, N., Konrad, K., and Van Lente, H. (2006). The sociology of expectations in science and technology. *Technology Analysis & Strategic Management*, *18*(3-4), 285-298. doi: 10.1080/09537320600777002.

Bridge, G. (2009). Material worlds: Natural resources, resource geography and the material economy. *Geography compass*, *3*(3), 1217-1244. https://doi.org/10.1111/j.1749-8198.2009.00233.x

Brown, N., Rappert, B., and Webster, A. (Eds.) (2000). *Contested Futures: A Sociology of Prospective TechnoScience*. Aldershot, UK: Ashgate.

Brown, N. and Michael, M. (2003). A Sociology of Expectations: Retrospecting Prospects and Prospecting Retrospects. *Technology Analysis & Strategic Management, 15*(1), 3-18, doi: https://doi.org/10.1080/0953732032000046024

Budde, B. and Konrad, K. (2019). Tentative governing of fuel cell innovation in a dynamic network of Expectations. *Research Policy, 48*(5), 1098-1112. https://doi.org/10.1016/j.respol.2019.01.007

Çalişkan, K., MacKenzie, D. and Callon, M. (2024): Stacked economization: a research program for the study of platforms, *Journal of Cultural Economy*. https://doi.org/10.1080/17530350.2024.2423687

Callon, M. (1984). 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay'. In Law, J. (ed.): Power Action and Belief: *A New Sociology of Knowledge?*. London: Routledge & Kegan Paul: 196-233.

Callon, M. (1984). The Sociology of an Actor-Network: The Case of the Electric Vehicle. In Callon, M., Law, J., & Rip, A. (Eds.), *Mapping the Dynamics of Science and Technology* (pp. 19-34). Palgrave Macmillan, London. https://doi.org/10.1007/978-1-349-07408-2_2

Callon, M. (1991). 'Techno-economic networks and irreversibility'. In Law, J. (ed.): *A Sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge: 132-161.

Callon, M. (ed.). (1998). *Laws of the markets*. Blackwell Publishers/ The Sociological Review.

Callon, M. (2005). Why Virtualism paves the way to Political Impotence: A Reply to Daniel Miller's Critique of The Laws of the Markets. *Economic Sociology: European Electronic Newsletter 6*(2), 3-20.

Callon, M. (2021). *Markets in the making – rethinking competition, goods, and innovation.* Translated by Olivia Cuter, edited by M. Poon. Brooklyn, New York: Zone Books – near futures.

Callon, M. Millo, Y. and Muniesa, F. (eds.) (2007). Market devices. Malden, Massachusetts: Blackwell Publishing/The Sociological Review.

Callon, M. and Law, J. (2005). On qualculation, agency, and otherness. *Environment and Planning D: Society and Space*, *23*(5), 717-733. https://doi.org/10.1068/d343t

Cambrosio, A., Limoges, C. & Hoffman, E. (1992). *Expertise as a Network: A Case Study of the Controversies over the Environmental Release of Genetically Modified Organisms*. Pp. 341-61 in The Culture and Power of Knowledge, edited by Nico Stehr and Richard V. Ericson. Berlin: Walter de Gruyter.

Christophers, B. (2022). Fossilised Capital: Price and Profit in the Energy Transition. *New Political Economy, 27*(1), 146-159, https://doi.org/10.1080/13563467.2021.1926957

Clausen, L. T., Nyborg, S., & Rudolph, D. P. (2021). The good process or the great illusion: A spatial perspective on public participation in Danish municipal wind turbine planning. *Journal of Environmental Policy and Planning, 23*(6), 732-751.

Cochoy, F., Trompette, P. and Araujo, L. (2016). From market agencements to market agencing: an introduction. *Consumption Markets & Culture, 19*(1), 3-16, https://doi.org/10.1080/10253866.2015.1096066

Cointe, B. (2022). Scenarios. Chapter 15 in Kari D. Pryck & Mike Hulme: *A critical assessment of the intergovernmental panel on climate change,* PART III: Knowledges, 137-147. Cambridge: Cambridge University Press & Assessment 2023, doi: 10.1017/9781009082099.

Cointe, B. and Asdal, K. (2025). The performativity test. Chapter 6 in Susy Geiger, Katy Mason, Neil Pollock, Philip Roscoe, Annmarie Ryan, Stefan Schwarzkopf, and Pascale Trompette (eds.) (2025). Cambridge: Cambridge University Press., p. 100-113.

Collins, H. and Evans, R. (2007). *Rethinking Expertise.* Chicago: Chicago University Press. https://doi.org/10.7208/9780226113623

Daggett, C. N. (2019). *The birth of energy: Fossil fuels, thermodynamics and the politics of work*. Dunham: Duke University Press.

Dalsgaard, S. and Kirkegaard, J. K. (work-in-progress). The power of 'x' – Analysing power-to-x as potential. Presentation of paper draft at STS Hub, Berlin, March 12th 2025.

Danish Energy Agency (2023). *Analyseforudsætninger til Energinet 2022 – Høringsnotat*, 05.01.23, J nr. 2022 – 13659.

Danish Ministry of Climate (02-2021). Ownership and Construction of Energy Islands. Aftaletekst – Energiøer – Ejerskab og konstruktion af energiøer mv.pdf (kefm.dk), Danish Ministry of Climate, Energy & Utilities, 1523908X.2018.1443005

Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of Environmental Psychology, 30*(3), 271–280. https://doi.org/10.1016/j.jenvp.2010.01.008

Dewey, J. (1939). *Theory of valuation*. Chicago: University of Chicago Press.

Doganova, Liliana, Martin Giraudeau, Claes-Fredrik Helgesson, Hans Kjellberg, Francis Lee, Alexandre Mallard, Andrea Mennicken, Fabian Muniesa, Ebba Sjögren, and Teun Zuiderent-Jerak (2014). Valuation Studies and the Critique of Valuation. *Valuation Studies, 2*(2), 87-96. https://doi.org/10.3384/vs.2001-5992.142287.

Doganova, L. (2024). *Discounting the future – the ascendancy of a political technology*. Brooklyn, New York: Zone Books – near futures.

Doganova, L., and Karnøe, P. (2015). Clean and profitable: entangling valuations in environmental entrepreneurship. In A. B. Antal, M. Hutter, & D. Stark (Eds.), *Moments of Valuation: Exploring Sites of Dissonance*. Oxford: Oxford University Press.

Dokk-Smith, I., Kirkegaard, J. K. and Szulecki, K. (2022). A functional approach to decentralization in the electricity sector: learning from community choice aggregation in California. *Journal of Environmental Planning and Management*, https://doi.org/10.1080/09640568.2022.2027233

Draghi, M. (2024). The future of European Competitiveness. 9th of September 2024.

DTU & AAU (2021). Cutululis, N. A., Blaabjerg, F., Østergaard, J., Bak, C. L., Anderson, M., Silva, F. M. F. D., Johannsson, H.,Wang, X., & Jørgensen, B. H. (2021). *The Energy Islands: A Mars Mission for the Energy system.*

Ellis, G., Schneider, N., and Wüstenhagen, R. (2023). Dynamics of social acceptance of renewable energy: An introduction to the concept. *Energy Policy*, *181*. Elsevier Ltd. https://doi.org/10.1016/j.enpol.2023.113706

Energy Island Forum (2024). *Making energy islands a success*. Roadmap.pdf

European Commission (2020): A hydrogen strategy for a climate-neutral Europe, Document 52020DC0301, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, COM/2020/301 final. Brussels, 08.07.2020.

Eyal, G. (2013). For a sociology of expertise: The social origins of the autism epidemic. *American Journal of Sociology* 118(4): 863-907.

Eyal, G. and Buchholz, L. (2010). From the Sociology of Intellectuals to the Sociology of Interventions. *Annual Review of Sociology, 36*, 117-137

Fourcade, M. (2009). *Economists and societies – discipline and profession in the United States, Britain, & France, 1890s to 1990s*. Princeton, New Jersey: Princeton University Press.

Fournier, V. (2013). Commoning: on the social organisation of the commons. *M@n@gement, 16*(4), 433-453.

Frandsen, S. L. and Laage-Thomsen, J. (2020). Pandemic Intellectuals. *Acta Sociologica, 63*(4), 436-438. https://doi.org/10.1177/0001699320961810

Frankel, C., Ossandón, J., and Pallesen, T. (2019). The organization of markets for collective concerns and their failures. *Economy and Society, 48*(2), 153-174.

Frantzen, D. N. (2025). *Turbulent transitions – valuation struggles and compromises in the becoming of wind energy in Denmark*. PhD thesis, DTU.

Frantzen, D., Nyborg, S., Kirkegaard, J. K. (2023). Taking the Bird's-eye view: Infrastructuring bird-turbine relations during wind power controversies. *STS Encounters.* https://tidsskrift.dk/encounters/article/view/139813

Geiger, S. (ed.) (2021). *Healthcare activism – markets morals, & the collective good*. Oxford: Oxford University Press.

Geiger, S. (2025). Market designs and market misfires. Part I in Susy Geiger, Katy Mason, Neil Pollock, Philip Roscoe, Annmarie Ryan, Stefan Schwarzkopf, and Pascale Trompette (eds.) (2025). *Market Studies Mapping, Theorizing and Impacting Market Action.* Cambridge: Cambridge University Press., p. 19-22.

Geiger, S., Harrison, D., Kjellberg, H. and Mallard, A. (eds.) (2015). *Concerned markets – economic ordering for multiple values.* Cheltenham, UK: Edward Elgar.

Geiger, S., Mason, K., Pollock, N., Roscoe, P., Ryan A., Schwarzkopf, S. and Trompette, P. (eds.) (2025). *Market Studies Mapping, Theorizing and Impacting Market Action.* Cambridge: Cambridge University Press.

Gibson-Graham, J. K., Cameron, J., & Healy, S. (2016). Commoning as a postcapitalist politics 1. In Amin, A., & Howell, P. (Eds.). *Releasing the Commons. Rethinking the future of the commons,* (pp. 192-212). Routledge.

Grandclément, C. and Nadaï, A. (2018). Transitioning Trough Markets, with contributions from Béatrice Cointe, Vincent Banos, Jeofrey Dehez, Olivier Labussière, and Tomas Reverdy. Chapter 3 in *Energy Transitions – a socio-technical inquiry*, 101-142. Cham: Palgrave MacMillan.

Granovetter, M. 1985. Economic Action and Social Structure: The Problem of Embeddedness. In: American Journal of Sociology 91, S. 481–510.

Haakonsson, S., Kirkegaard, J. K., and Lema, R. (2020). The decomposition of innovation in Europe and China's catch-up in wind power technology: the role of KIBS. *European Planning Studies,* 1-19, https://doi.org/10.1080/09654313.2020.1712329

Hardie I. and Mackenzie D. (2007). Assembling an economic actor: the agencement of a Hedge Fund. *The Sociological Review*, *55*(1), 57-80. https://doi.org/10.1111/j.1467-954X.2007.00682.x

Hardin, G. (1968). The Tragedy of the Commons. *Science*, *162*(3859), 1243-1248.

Helgesson, C-F. and Muniesa, F. (2013). For What It's Worth: An Introduction to Valuation Studies. *Valuation Studies, 1*(1), 1-10. https://doi.org/10.3384/vs.2001-5992.13111

Hess, D. J. (2011). Electricity Transformed: Neoliberalism and Local Energy in the United States. *Antipode, 43*(4), 1056-1077. https://doi.org/10.1111/j.1467-8330.2010.00842.x

Hess, D. J. (2019). Coalitions, Framing, and the Politics of Energy Transitions: Local Democracy and Community Choice in California. *Energy Research & Social Science*, *50*, 38-50. https://doi.org/10.1016/j.erss.2018.11.013

Hess, D. J. and Sovacool, B. K. (2020). Sociotechnical matters: Reviewing and integrating science and technology studies with energy social science. *Energy Research & Social Science 65*, 101462, 1-17. https://doi.org/10.1016/j.erss.2020.101462

Hirschman, D. and Berman, E. P. (2014). Do economists make policies? On the political effects of economics. *Socio-Economic Review, 12*, 779-811. https://doi.org/10.1093/ser/mwu017

Huron, A. (2015). Working with strangers in saturated space: Reclaiming and maintaining the urban commons. *Antipode, 47*(4), 963-979. https://doi.org/10.1111/anti.12141

Jenkins, K., McCauley, D., Heffron, R., Stephan, H. and Rehner, R. (2016). Energy justice: A conceptual review. *Energy Research & Social Science, 11*, 174-182, https://doi.org/10.1016/j.erss.2015.10.004

Kama, K. (2015). Circling the economy: resource-making and marketization in EU electronic waste policy. *Area*, *47*(1), 16-23. https://doi.org/10.1111/area.12143

Karnøe, P., Kirkegaard, J. K., and Çalişkan, K. (2022). Introducing the lens of markets-in-the-making to Transition Studies: The case of the Danish wind power market agencement. *Environmental Innovation and Societal Transitions*, 44, 79-91, https://doi.org/10.1016/j.eist.2022.05.003.

Karnøe, P. and Kirkegaard, J. K. (2025, forthcoming). Windpowering Denmark - How a series of experimentations transformed the role of wind power in Danish society. Submitted for *Handbook on Living Labs and Real-World Experiments*, edited by Brice Laurent and Sebastian Pfotenhauer, Edward Elgar. (accepted chapter, book to be published 2025).

Kirkegaard, Julia K. (2015). *Ambiguous Winds of Change – Or Fighting Against Windmills in Chinese Wind Power: Mapping Controversies over a Potential Turn to Quality in Chinese Wind Power.* Frederiksberg: CBS [Phd], 2015. 486 p. (PhD Series; No. 05-2015). Publication: Research › Ph.D. thesis.

Kirkegaard, J. K. (2019). *Wind Power in China – Ambiguous Winds of Change in China's Energy Market*. Routledge: New York. (edt. Peter Sowden and Peter Nolan; Routledge Studies on the Chinese Economy).

Kirkegaard, J. K. (2023). Jordejere og projektudviklere laver hemmelige kontrakter om, hvor vindmøller skal stå, 26th of March 2023; Videnskab.dk. Forskerzonen, https://videnskab.dk/teknologi/jordejere-og-projektudviklere-laver-hemmelige-kontrakter-om-hvor-vindmoeller-skal-staa/

Kirkegaard, J. K., Cronin, T., Nyborg, S. and Karnøe, P. (2020). Paradigm shift in Danish wind power – the (un)sustainable transformation of a sector. *Journal of Environmental Policy and Planning, 23*(1), 97-113, DOI:10.1080/1523908X.2020.1799769.

Kirkegaard, J. K. and Çalişkan, K. (2018). When Socialists Marketize: The Case of China's Wind Power Market Sector. *Journal of Cultural Economy, 12*(2), 154-168. https://doi.org/10.1080/17530350.2018.1544581

Kirkegaard, J. K. (2017). Tackling Chinese Upgrading Through Experimentalism and Pragmatism: The Case of China's Wind Turbine Industry. *Journal of Current Chinese Affairs, 46*(2), 7-39. https://doi.org/10.1177/186810261704600202

Kirkegaard, J. K. and Nyborg, S. (2021). ANT perspective on wind power planning and social acceptance. Book chapter for S. Batel & D. P. Rudolph (2021): *A critical approach to the social acceptance of renewable energy infrastructures – Going beyond green growth and sustainability*. Palgrave Macmillan.

Kirkegaard, J. K., Cronin, T., Nyborg, S. and Frantzen, D. (2025). The multiple understandings of wind turbine noise: The unruly epistemic object of noise. *Wind Energy Science* https://doi.org/10.5194/wes-2024-34

Kirkegaard, J. K., Nyborg, S., Georg, S., and Horst, M. (2023). Towards failed renewable energy communities? Activist attempts to change market conditions in the Danish wind energy market. *Energy Research & Social Science*, 102, 103152. https://doi.org/10.1016/j.erss.2023.103152

Kirkegaard, J. K., Rudolph, D. P., Cronin, T., Nyborg, S. (2022). The landrush of wind energy, its socio-material workings, and its political consequences: On the entanglement of land and wind assemblages in Denmark. *Environment and Planning:C* (EPC). https://doi.org/10.1177/23996544221143657

Kirkegaard, J. K., Rudolph, D., Nyborg, S., Solman, H., Gill, E., Hallisey, M., Cronin, T. (2023). Tackling the Grand Challenge of climate change through a socio-technical perspective and the case of wind energy. *Nature Energy, 8,* 655-664, https://www.nature.com/articles/s41560-023-01266-z

Kirkegaard, Pallesen, Breslau, Cronin (forthcoming). Energy tragedies. Organizing energy resources between commodification and commonification. Workshop paper presented at IMSW, June 2025.

Kjellberg, H. (2021). Market expertise at work: introducing Alvin E. Roth and Michel Callon. *AMS Review, 11*(3/4), 216-218. https://doi.org/10.1007/s13162-021-00217-9

Kjellberg, H. (2025). A vocabulary for analysing market change processes. Chapter 27, Part VI, in *Market Studies Mapping, Theorizing and Impacting Market Action*, pp. 438-454, Cambridge University Press 438-444. https://doi.org/10.1017/9781009413961.034

Knorr-Cetina, K. (1997). Sociality with objects: Social relations in postsocial knowledge societies. *Theory, culture & society, 14*(4), 1-30. https://doi.org/10.1177/026327697014004001

Knorr-Cetina, K. (1999). E*pistemic Cultures: How the Sciences Make Knowledge*. Harvard University Press. https://doi.org/10.2307/j.ctvxw3q7f

Kuchler, M. and Bridge, G. (2018). Down the black hole: Sustaining national socio-technical imaginaries of coal in Poland. *Energy Research & Social Science*, 41, 136-147. https://doi.org/10.1016/j.erss.2018.04.014

Labussière, O. and Nadaï, A. (2018). *Energy Transitions – a socio-technical inquiry*. Cham: Palgrave MacMillan.

Labussière, O., Banos, V., Fontaine, A., Verdeil, E., Nadaï, A. (2018). The Spatialities of Energy Transition Processes, with contributions from Jeofrey Dehez, Laurence Rocher, and Antoine Tabourdeau. Chapter 6 in *Energy Transitions – a socio-technical inquiry*, 239-276. Cham: Palgrave MacMillan.

Lamont, M. (2012). Toward a comparative sociology of valuation and evaluation. *Annual Review of Sociology, 38,* 201-21. https://doi.org/10.1146/annurev-soc-070308-120022

Latour, B. (1983). Give me a laboratory and I will move the world. Ch. 6 in Knorr, K. et Mulkay, M. (eds.): *Science Observed. Perspectives on the Social Study of Science*. Beverly Hills, California: Sage, 141-170. http://www.bruno-latour.fr/sites/default/files/12-GIVEME-A-LAB-GB.pdf

Latour, B. (1987). *Science in Action. How to Follow Scientists and Engineers through Society.* Cambridge, MA: Harvard University Press.

Latour, B. (1990). *Technology is Society Made Durable*. The Sociological Review, 38(1), https://doi.org/10.1111/j.1467-954X.1990.tb03350.x

Latour, B. (1992). 'Where are the missing masses: Sociology of a few mundane artefacts'. In Bijker, W. and Law, J. (eds.): Shaping Technology-Building Society. Cambridge, MA: MIT Press, 225-259.

Law, J. (1994): Organizing Modernity: Social Ordering and Social Theory. Oxford: Blackwell.

Latour, Bruno. 2005. Critical distance or critical proximity. Unpublished Manuscript. Accessed March 31, 2014. http://www.bruno-latour.fr/sites/def ault/files/p-113-haraway.pdf.

Linebaugh, P. (2008). *The Magna Carta manifesto: Liberties and commons for all*. Univ of California Press.

McFall, L. (2014). *Consumption: Cultural Economies of Insurance, Credit and Spending*, 1–196. https://doi.org/10.4324/9780203147870

Mirowski, P. (1989), *More heat than light – economics as social physics: Physics as nature's economics*. Cambridge: Cambridge University Press.

Mouffe, C. (2011). *On the Political.* Routledge.

Muniesa, F. (2011). A flank movement in the understanding of valuation. *Sociological Review, 59*, 24-38. https://doi.org/10.1111/j.1467-954X.2012.02056.x

Munk, A. K. (2022). Caring as Critical Proximity: A Call for Toolmaking in Digital Migration Studies. In: Sandberg, M., Rossi, L., Galis, V., Bak Jørgensen, M. (eds) *Research Methodologies and Ethical Challenges in Digital Migration Studies. Approaches to Social Inequality and Difference*. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-81226-3_10

Nadaï, A. and Cointe, B. (2020). Turning Sunlit Rooftops and Windy Sites into Energy Assets, chapter 6 in Kean Birch and Fabian Muniesa (eds.), *Assetization: Turning Things into Assets in Technoscientific Capitalism*, 49-169, https://doi.org/10.7551/mitpress/12075.003.0009

Ossandón, J. (2024). Local economic planning as a problem for market studies. Notes after Asdal & Huse's Nature-made economy: cod, capital, and the great economization of the ocean, *Journal of Cultural Economy*, https://doi.org/10.1080/17530350.2024.2423704

Ossandón, J. & Onto, G. (2022). *Do ethnographers make markets? Cultural Economy after collaboration.* Presented at the EGOS conference, Vienna, 7-9 July 2022; sub-track 33: Organization of market imperfection & market designers as market organizers.

Ossandón, J. and Pallesen, T. (2025): The new new economic sociology – the market intervention test. *Journal of Cultural Economy*, https://doi.org/10.1080/17530350.2025.2451252

Ossandón, Pallesen, Karnøe and Georg (2025). Making Good Economies with Bad Economic Instruments: A brief history of wind power's changing economies. *Valuation Studies, 12*(1), 67-95. https://doi.org/10.3384/VS.2001-5992.2025.12.1.67-95

Ostrom, E. (2008): Tragedy of the Ecological Commons, Encyclopedia of Ecology, 3573-3576, https://doi.org/10.1016/B978-008045405-4.00634-0.

Pallesen, Trine. 2016. Valuation Struggles over Pricing – Determining the Worth of Wind Power. *Journal of Cultural Economy, 9*(6), 527-540. https://doi.org/10.1080/17530350.2016.1212084

Pollock, N. and Williams, R. (2010). The business of expectations: How promissory organizations shape technology and innovation. *Social Studies of Science, 40*(4), 525-548.

Rudolph, D. P. and Kirkegaard, J. K. (2019). Making space for wind farms: Practices of territorial stigmatisation in rural Denmark. *Antipode 51*(2), 642-663. https://doi.org/10.1111/anti.12428

Ryan, A. (2025: Future (Imperfect) Markets. Part VII, in Geiger, S., Mason, K., Pollock, N., Roscoe, P., Ryan A., Schwarzkopf, S. and Trompette, P. (eds). *Market Studies Mapping, Theorizing and Impacting Market Action.* Cambridge: Cambridge University Press, 455-458.

Solman, H., Kirkegaard, J. K., Kloppenburg, S. (2023). Wind energy and noise: Forecasting the future sounds of wind energy projects and facilitating Dutch community participation. *Energy Research & Social Science, 98*(103037), 1-9, https://doi.org/10.1016/j.erss.2023.103037

Solman, H., Kirkegaard, J. K., Smits, M., van Vliet, B. & Bush, S. (2021). The promises and perils of digital twins for wind turbine innovation: Boundary conditions for (co-)production of wind energy technologies and landscapes by the experts, and the public? Environmental Science & Policy. https://doi.org/10.1016/j.erss.2023.103037

Stark, D. (2000). *For a Sociology of Worth*. https://www.researchgate.net/publication/251651120_For_a_Sociology_of_Worth

Stark, D. (2009). *The sense of dissonance – accounts of worth in economic life*. Woodstock, Oxfordshire: Princeton University Press.

Van Lente, H. & Rip, A. (1998). Expectations in technological developments: an example of prospective structures to be filled by agency, in: C. Disco & B. van der Meulen (Eds.), *Getting New Technologies Together – Studies in Making Sociotechnical Order*. Berlin: De Gruyter.

Whatmore, S. J. (2009). Mapping knowledge controversies: science, democracy and the redistribution of expertise. *Progress in Human Geography, 33*(5), 587-598.

Woolgar, S., & Lezaun, J. (2013). The wrong bin bag: A turn to ontology in science and technology studies?. *Social studies of science 43*(3), 321-340.

Wüstenhagen, R., Wolsink, M., and Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, *35*(5), 2683-2691. https://doi.org/10.1016/j.enpol.2006.12.00

www.stm.dk: Mette Frederiksens nytårstale 1. januar 2022. Mette Frederiksens nytårstale 1. januar 2022 - Statsministeriet