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Transitioning Through Markets

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List of abbreviations

EU	European Union
STS	Science and Technology Studies
PV	Photovoltaic
EDF	Electricité de France

C. Grandclément—The information and views set out in this text are those of the author only and do not reflect the official position of EDF.

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EDF-AOA	Branch of EDF in charge of purchase obligation contracts
BM	Balancing Mechanism
RTE	Réseau de Transport d'Electricité (French Transport System Operator)
kWh	kiloWatt hour
CRE	French Energy Regulator (Commission de Régulation de l'Énergie)
CURTE	Committee of electricity transport grid user-clients (Comité des clients utilisateurs de RTE)
DLS	Distributed Load Shedding

1 Introduction

The conduct of the energy transition is now associated to markets in various respects. In official policy circles, conducting the energy transition through markets is associated to numerous benefits. It is held that free markets and fair competition will provide economic actors with a 'level playing field', opening up new possibilities for individuals to act and for companies, products and services to develop. By fostering innovation, it is said, markets will 'fix' our energy problem. In setting free economic forces, markets will allow the current lock-ins and dependence on carbon-based energy sources to be overcome. The appeal of a market-based energy transition lies also in the supposed efficacy of market coordination in conducting change, in contrast to the assumed slowness of political and administrative processes. 'Passing' the energy transition through markets, on such accounts, will alleviate its costs for public budgets and make its politics easier to manage. Last but not least, a consideration closely associated to markets is the understanding that the energy transition will not threaten the living standards and norms of comfort of the Western world. Indeed, in 'passing through' markets, the energy transition may fuel new economic growth—it may create more wealth, especially in Europe.

This chapter examines the contribution of markets to the energy transition. More precisely, it examines the use of markets as an instrument to incentivise private actors to engage in energy transition processes. How do actors react to these instruments? What effects are generated? In line with the general approach in this volume, this chapter pays attention to the entities recruited into energy transition processes: here, through market-based instruments particularly. The paper examines the extent to which new 'energy transition markets' may or may not give rise to the new and unexpected. It explores the practical consequences of the close association between energy transitions and markets using analytical tools from economic sociology. Our case studies suggest that there is considerable ambiguity in what the markets may do to the energy transition. In what follows, we examine cases in which the market has to be circumvented or considerably modified to accommodate energy transition technologies, goods and services. We also look at cases in which the creation of a market relies heavily on pre-existing actors and their ability to assemble, graft and compose. In other words, as new markets capitalise on existing social and technical relationships, 'investments in forms' and market organisations, they remain very much dependent upon the pre-existing distribution of action capacities and power relationships. To varying extents, instead of markets opening up new and 'open' fields for competition, we end up with assemblages of new markets which build on and incorporate pre-existing markets and power relations.

The chapter is divided into five sections. The first section briefly sketches out EU actions towards extending markets as a policy tool in the field of environment and climate. The second and third sections present some theoretical elements drawn from economic sociology that we will use in order to discuss this policy. The fourth section critically examines the making of markets to conduct an energy transition in France through four case studies. These case studies are of the use of tree stumps as conventional fuelwood, non-residential photovoltaic (PV) production, the development of 'smart home' infrastructure and the market valuation of residential load shedding. The fifth and final section is a general discussion of the use of markets as vehicles for the energy transition.

2 Bringing About the Energy Transition in Europe Through the Market

The idea that the market may free economic forces, allow innovative activity and contribute to alleviating institutional lock-in has a long political history, and in recent years has been translated into EU and

French climate energy policy. In the EU, the close association between the market and the energy transition has become increasingly explicit since the late 1990s, as the EU began to endow energy and climate policies with an unprecedented regulatory basis (Jabko 2006; Van der Vleuten and Lagendijk 2010). In the space of just over a decade, a set of directives and texts—an EU White Paper (1997),[1] the European Climate Change Programme (2000),[2] the Renewable Electricity Directive (2001),[3] the Biofuels Directive (2003),[4] the Renewable Energy Directive (2009),[5] and the '3 × 20' Third Energy Package—marked a progressive transition away from voluntary targets and sectorial approaches to renewable energy provision and towards compulsory requirements and a more integrated approach to tackling global issues such as renewable energies and energy demand.

Even as the new targets embedded in climate policies require member states to adopt and implement stringent and innovative energy policies, the liberalisation of the energy sector (gas and electricity) (2003)[6] has been deeply modifying the ramifications of energy policies. Notions such as 'externality', 'level playing field' and 'fair competition among the different types of energies' have inspired EU energy policy. The project of liberalising energy markets while accounting for all externalities, so as to reveal the full social cost of energies through their prices, was repeatedly defended as the best way to bridge market efficiency and sustainable development. The logic of the argument was that this would allow EU policymakers to eliminate hidden subsidies to conventional energies, hence ensuring fair competition between all forms of energies and fostering the development of renewable energies. While this economic logic legitimises liberalisation in terms of sustainable development (e.g., liberalising the electricity market is good for the environment as it allows renewable energy to penetrate it; it is more democratic as it allows consumers/citizens to voice their choices through the free market, etc.), it also points to the fact that energy policy no longer can be conceived as a separate box. Foremost among the issues crossing policy domains are environmental externalities: beyond energy as such, these evolutions in the EU's approach to energy issues highlight the intersection between Europe's renewable energy policy and its regulations and aspirations to protect and improve the environment. This connection sets energy policy on course to be a multidimensional and multi-scalar process.

In gradually implementing EU regulatory frameworks and adopting its neoliberal approach, France's approach to climate and energy policy has profoundly shifted towards a market-based form of governance. In the field of electricity, since the early 2000s, the French state has progressively dismantled the former organisation of its utility as a public service monopoly in order to implement a market organisation (Reverdy 2014). It initiated a diversification of its electricity mix through market instruments by adopting a feed-in tariff for renewable electricity,[7] developing competitive tenders (biomass energy, offshore wind power generation) and by reforming its energy policy programming law.[8] The French state also launched a massive programme aimed at developing market-ready technologies for sustainability-related purposes. The programme, called 'Investments for the Future' (Investissements d'Avenir), was set up after the 2008 crisis. It funds demonstrators of technologies such as electric vehicles and charging infrastructure, smart grids, renewable energies, energy storage, fuel cell batteries, carbon capture and storage, etc. The notion of demonstrators, geared at developing market-ready technologies, marked a turn towards the commercialisation of research in France. This turn is in keeping with the 'Lisbon strategy' for research and technology at the European level (Bruno 2008). This series of reforms follows on the idea that new technologies delivered through markets are key to tackling climate change. They are the conjunction of two gospels of the contemporary era: technological optimism and neoliberalism.

3 Markets as Levers to Unlock the Energy Transition

On several counts, the use of markets to conduct the energy transition is similar to that of technologies. There is a tendency to expect that technologies and/or markets will provide a ready-made solution to problems that seem far beyond human control, or whose handling would require complex political processes. Such approaches have been criticised for the undue hope that they place on technologies. Above all, critics of such 'technological fixes' argue that technologies often do not solve actual problems, and that worse, they create others (see for instance Illich 1973; Hard and Jamison 2005). Basing the energy transition on markets present a very similar case, which we may call the 'energy transition market fix'. In conducting an energy transition through markets, governments may expect that through competition and entrepreneurship, new actors, technologies and patterns will emerge to 'unlock' what was previously locked. Markets are seen as a way to 'fix' the energy transition in a single step. This vision is quite at odds with the very idea of a transition which, notwithstanding the complex layering of temporalities involved, means at least that past and future situations are linked through a present with some form of duration.

The idea that the market fosters newness and can potentially overcome lock-in by offering a level playing field for actors to innovate has been challenged in many ways. Evolutionary economics, for instance, has shown that small events or path dependency can decide the fate of a technology, and that rather than the most efficient technology being selected, it is the technology that is selected that becomes the most efficient because it is supported (e.g., Nelson and Winter 1982; Foray and David 1995; David 1985). In economics parlance, therefore, the market can very well steer towards suboptimal choices.

The idea that the outcome of a competition is not necessarily the best possible solution is also widely shared by STS scholars working on innovation (MacKenzie and Wajcman 1985; Latour 1987; Bijker et al. 1989). Instead, the 'success' of an innovation depends on the mobilisation and alignment of allies in all sorts of realms (scientific, legal, commercial, end users, etc.) and the circumventing of adversaries. In order to retrace these processes, it is important not only to trace back the factors that led to the outcome, but also to account for the roads not taken. This important methodological principle in the sociology of innovation is sometimes summarised as avoiding doing 'Whig history', or as the 'first symmetry principle' (studying the losing sides as much as the winning one). As argued by Madeleine Akrich (1989), recomposing and qualifying both the technology and its environment is part of the process by which any socio-technical system emerges, and the work of co-constructing the environment and the technology in order to market the latter as offering superior performance is later erased in an effort to legitimate choices (by making it seem that they follow from the state of Nature). Akrich points to this as an ontological dimension of socio-technical systems, because properties that were worked out in the process of their emergence are presented ex post as being essential to the entities engaged in this process, thus supporting the idea that it is in fact the most efficient solutions that have been selected.

Finally, another line of objection to the idea of the market as a tool for developing innovative solutions to non-market problems can be found in the transition management literature. Building on the idea from economics that innovation needs niches to develop and are at risk near the point of market access (death valley), this literature has developed a (somewhat linear) model of innovation development that would only gradually expose an innovation to the destructive forces of market competition (Schot and Geels 2008). In this literature, however, once innovations are consolidated, the most efficient can be selected through confrontation on the market.

This line of discussion is not the angle we will adopt in our analysis of the use of markets as vehicles for the energy transition. Instead, we will take aim at an issue which, in a way, is 'upstream' of the question of the virtues of competition. Our interest in this chapter lies in the use of markets as policy tools. William Davies argues that the recourse to economics in public life in the form of markets or of tools that mimic markets reflects a disenchantment with politics (Davies 2014). According to his argument, if markets are tools and if politics is administered through such tools, this means that the use of markets to conduct energy transition processes is a way of depoliticising the energy transition, to take the politics out of the issue. The question that will guide our empirical inquiry here is that of the politics left, removed, or perhaps created, in energy transition markets. To do so, we will examine concrete processes of market creation. In adopting a detailed view of actual markets, we apply some important methodological principles from a particular branch of economic sociology known as 'market studies', which we present in the next section.

4 From Principles to Practices: Economic Sociology and the Empirical Study of Markets

There are many overall critiques of neoliberalism and the market, some of which have offered especially penetrating analyses (Dardot and Laval 2014; Davies 2014; Hibou 2015). But while this type of critical work is very important in making intelligible the logics and consequences of neoliberalism, in what follows we will refrain from bringing the discussion to too general a level. Our ambition in this chapter instead is to examine the particulars of the actual implementation of markets to bring about the energy transition. How is it possible in practice to transform climate care into a commercial endeavour? What kind of markets are put in place? How do they work, and with what consequences? Finally, what really becomes of the energy transition itself when it is conducted through markets? These are the questions we aim to answer through an examination of four empirical case studies, in which markets or market-based tools are used for the energy transition.

In approaching markets (plural) rather than the market (singular), we follow in a relatively recent but now well-established tradition in economic sociology, sometimes called the 'new new economic sociology' (McFall 2009), the 'performativity programme' (Fourcade 2007; Callon 2010; Cochoy et al. 2010), or 'market studies' (Geiger et al. 2015a). The origins of this tradition in science and technology studies brought a commitment to focus on moments of innovation and a penchant for the foregrounding of materials and instruments in the study of markets in the making. A distinctive trait of the 'new new economic sociology' hence lies in its attention to processes of market creation. One of its main contributions is the notion of 'market devices', and its use as a starting point in the study of markets (Callon and Muniesa 2005; Callon et al. 2007). The market devices approach offers a vocabulary to describe and analyse that all-important ingredient of economic life—markets. It does so without resorting to the vocabulary of economics, which does not simply reflect a reality out there but contributes to shaping it, as demonstrated by numerous works in the 'performativity programme' (Callon 1998b; Mitchell 1998; MacKenzie et al. 2007;

MacKenzie 2008). Instead, what constitutes the seller, the buyer, the good, the price and the general dynamics of the exchange need not be taken for granted, but instead can be the object of inquiry.

The market device literature thus breaks from a substantive vision of 'the market' as a source of power, domination and even resistance. Instead, concrete, practical, mundane and often-overlooked market devices are the primary focus of empirical and analytical investigation. This investigation often starts with an inquiry into the exchanged goods themselves, which, as Callon points out, are not given, but have to be specified in what is often a controversial and political process (Callon et al. 2002; Callon and Muniesa 2005; Callon 2007a). The result of such examination is a 'thick' rendering of markets, as opposed to the flatness of their understanding as mere mechanisms for allocation and coordination (Callon 2013). A second and interlinked feature of the literature lies in its granting of agency to all sorts of things (things that are sometimes called 'non-human') (Callon 2008; MacKenzie 2009). Markets are investigated without any prior judgment of what the market is and of what within it is social, technical, political, moral, economic, human, or other. In line with a typical ANT stance (Callon 1986a, b; Latour 2005), these are emergent categories that are sometimes but not always delineated in the course of the processes that sociologists study. Market devices are not limited to material, practical things, but encompass all sorts of things, from calculating equipment to statements pointing to the device (Callon 2007b). In other terms, what is at stake in so considering market devices as impure hybrids (rather than as perfect emanations of an economic order) is the possibility of grasping power as it is exerted in practice and political issues as they arise at the very core of markets (Callon 2007a; Cochoy et al. 2010; Marres 2012; McFall 2014). These will be the guiding principles in our empirical exploration of the making and running of four different market devices intended to fuel the energy transition.

5 Case Studies

The four case studies explored in this section span a wide range of energy transition processes, with regard both to the technologies and resources concerned—biomass energy, solar PV, smart electric meters, distributed load shedding for the electricity grid—and to their outcomes. Some apparently qualify as successes with regard to energy change and participation, some as unsuccessful, and some are mixed. Our description of each below aims to bring to light the transformation of energy transition claims into markets, and the consequences of recourse to markets for the politics of the energy transition.

5.1 Turning Tree Stumps into Biomass Electricity—A Case of Appropriation and Exclusion

The Landes de Gascogne region (on the south-western Atlantic coast of France) is among the French regions with the most highly exploited forest resources. Landes is largely covered by a major pine forest which is privately owned, and where there are a number of major pulp and paper industry installations. Two major storms in 1999 and 2009 literally wrecked this forest land, making 'available' a potential new wood resource: tree stumps. The use of tree stumps in traditional industrial processes poses a series of technical challenges. Nevertheless, in a context marked by tensions around the provision of wood products for traditional wood-based industries such as paper industries, local actors deemed it worthwhile to try to overcome these challenges. In what follows we will not explore these technical challenges (for more detailed accounts see Banos and Dehez 2017; Dehez and Banos 2017) but will instead focus on the economic processes through which actors of one specific type appropriated tree stumps for their own exclusive benefit.

Over the past decade, the availability of wood provision resources has been challenged by the emergence of what is called 'wood-energy'—as opposed to other industrial uses of wood (paper, lumber and wood panels). The development of wood energy has been driven by economic incentives in the form of tenders organised by French public authorities—through successive calls in 2004 and 2011—in order to help set up a renewable electricity production industry. In the case of wood biomass, the tender policy has been widely criticised on a number of grounds: mismatches with the distribution and availability of the resource, the gigantic scale of the projects selected through the tenders, the very low rate of actual development that ensued, and the lack of transparency and continuity in public policy. Incentives for the development of biomass-based electricity have come to threaten the wood resources used by the pulp and paper industry. The pulp and paper industry lobbies have continuously emphasised the inappropriateness of national tenders and biomass electricity production to the configuration of wood resources at both national and local levels.

In the Landes de Gascogne region, however, rather than merely criticising these tender offers, major pulp and paper producers entered bids. Here, they used national policy support in order to upgrade their industrial equipment and buy new high-pressure boilers. State support followed conveniently on a few decades of experimentation within the Landes industrial cluster. High-pressure boilers made it possible for these companies to process a broader range of biomass resources, potentially including the tree stumps that the two major storms of 1999 and 2009 had made 'available'. These boilers also enabled electricity cogeneration out of the heat from paper production. In other words, in the present case, the tender—a market-based mechanism—helped the pulp and paper industries to transition from conventional wood sources to tree stumps through a technological upgrade (high-pressure boilers) to provide for their heat needs. But what does this economic process really 'fix' here? To put it differently, what kind of problem does the process solve, and what does it not solve?

The strategy of the pulp and paper industry in the Landes region could be described as follows. They played on their market power (monopsony) as well as on the post-storm situation itself and a series of discursive manoeuvres, in order to impose low prices for stumps: stumps cannot be sold for more than a token price; stumps are only a waste product, whose economic value lies not in the stump itself but rather in soils after their removal; stump harvesting is good for phytosanitary protection, replanting and future yields. This discourse was supported by regional research bodies and other local actors. The risk of Fomes was also invoked as an additional reason for stump harvesting. Fomes is a damaging and contagious root disease (fungus) affecting softwood trees. Leaving after-storm tree stumps in the field, they argued, increased the risk of contamination. Ashes from the industry's new high-pressure boilers were tested as fertiliser and as a means of return minerals to the land. Industrialists could thus also pose as making a public contribution, rather than as pursuing their own interest in a new, cheap source of supply. Last but not least, the Landes pulp and paper industry developed a strategy aimed at colonising peripheral wood massifs in order to capture new resources (in Dordogne), following this overall objective of not competing with wood materials which are actually used in the local timber and paper supply chains.

There have been various stump pricing mechanisms (Banos and Dehez 2017; Dehez and Banos 2017). At one point in time (2010), stumps were sold by the ton for 2 euros. This price was partly based on the rental prices of land where stumps were being stocked. A few years later (2014), the local forest owners' unions promoted another higher price (10 €/ton) based on the exploitation cost of stumps. Other actors, including energy operators but also many forest owners, have argued that the prices of stumps must be based on their heat value. Nevertheless, this last proposition still does not have wide support, and the possible equivalencies with other energy substitutes (e.g., green waste, wooden pallets…) remain hard to identify.

The participation of the Landes de Gascognes pulp and paper industry in the national tenders aimed at developing biomass-based energy could be read as the result of a strategy aiming at: (1) drawing on policy support (subsidies) in order to invest and renew a business model which is ageing and under threat of international competition; (2) securing access to the pine tree resource; and (3) hampering the entry of other biomass electricity producers into the region. Clearly, the power of pulp and paper industry as an incumbent, in a position of monopsony, having a hold on regional institutions and land owners, allowed it to pre-empt the access to this biomass resource by playing on all types of know-how and relations. Pulp and paper industrialists benefit from a range of assets and know-how which allow them to manage a dominant position in biomass electricity production. These notably include technological know-how (with high-pressure boiler technologies), power relations (monopsony position in relationship to local forest stakeholders), and networking with research institutions (experimentation on harvesting, fertilisation with boiler ash…). Our point here is not to say whether what this industry did using the national scheme for biomass development is good or bad. Instead, we are emphasising how, in this case, transition and change depend heavily on what existed before, and especially upon the ability of certain actors to use resources (namely, in this case, know-how, network position and leverage based on size) and to secure access to additional resources (a new kind of biomass).

This being said, it will be noticed that the power concentrated in the hands of a few industrial stakeholders also hampers the emergence of possible potentials associated with the process of energy transition. First, it hampers the economic diversification of several other industries whose productions are developed upstream in the supply chain (i.e. forest landowners, sawmills), and which thus constitute a major input to the pulp and paper production process. This contributes to a form of 'lock out'[9] in the current regional industrial trajectory. Second, the general pressure on the availability of wood resources as well as the announced impacts on local economic activity in the timber sector (competitiveness, rural employment…) has severely limited the development of tertiary heating systems within the Landes de Gascogne area. Overall, there has been little discussion of the potential redistribution of profits and existing wood resources.

In this case, then, we have an emergent resource, tree stumps, harvested and calibrated so as to take a place in what is basically conventional biomass-based energy production, while the dominant position of the paper industry is sustained. Here, mainstream dominant actors took hold of a state-supported mechanism (calls for tenders) to retain their dominance on a market. Even more, they appropriated this new resource in a way that excludes others who might potentially also make use of it. Other, perhaps more positive effects of the traditional paper industry could appear in the longer term, however, as they strive to change and adapt their current business model.

Interestingly, the asymmetries that arose in passing the energy transition through markets in this case partly relies on the fact that public policy further empowered large actors by supporting their investment in new technologies, reinforcing their monopsony. These asymmetries also depend on the incomplete informational context, as comparing the energy content of the different options in order to price the stumps was not made possible. The articulation between market access and the energy transition thus played out (negatively) around the valuation of tree stumps: certain actors seem to have had limited access to either information about the regional resource (privatised, opaque, monopsony) or the arena where the valuation of tree stumps was devised—they did not have an opportunity to take up a place in these processes.

The turn taken by state support in this case study partly results from a default policy. This policy frames the development of biomass energy as an economic and competitive activity, without formulating political ends. It does not acknowledge the necessary work of valuation entailed in such a development, nor the differentiated ability of different actors to engage in it. This leaves incumbents, who are best placed and equipped to direct market devices in their own interests, free to do so.

5.2 Adding PV Production to the Roofs of an Agricultural Cooperative: Subverting an Individual Incentive into a Shared One

The Fermes de Figeac photovoltaic project is an economic initiative clearly driven by policies encouraging the development of markets as a means to trigger dynamics of energy transition. It was initiated as a reaction to the high feed-in tariffs that were available for building-integrated photovoltaics (BIPV) in France in 2008 (about 60 eurocents/kWh, at a time when the costs of PV systems, though still high, were on a sharp decreasing trend). Feed-in tariff policies were meant to create a safe niche for investments in photovoltaics, by ensuring their profitability, and thereby to accelerate the 'maturation' of PV markets by inducing learning effects and cost reduction dynamics. The rationale for these policies was that without them, PV would not yet be on the electricity market due to high costs and risks (Cointe 2015). The Fermes de Figeac is a cooperative PV project which responded to this financial incentive to harvest a local resource (sunshine), develop a new and mutualised source of activity and income for a territory and for the members of the cooperative, and assert itself as an entrepreneurial actor in the energy transition.

The market dimension of the project is quite straightforward (for a more detailed account of this case, see Cointe 2016). Its originality lies in the ambition to mutualise and in its articulation to a set of values promoted by the cooperative, such as collective solidarity, territorial attachment, innovation conceived as a way to maintain a local culture, a long-term vision and transmission to future generations. The objective was to harvest a territorial resource that photovoltaic technologies made exploitable and that feed-in tariffs for BIPV made profitable: namely, rooftops exposed to sunshine. To do so, the cooperative developed a business model and a business plan designed to create economic activities and profits out of these rooftops, tapping into these profits for the territory and redistributing them among farmers and other territorial actors. The initiative was largely framed by the feed-in tariffs: obtaining the highest possible level of tariffs was a condition for the project to succeed. Expected gains were calculated on the basis of the number of roofs involved, estimates of solar radiation in the region, PV installation output and the level of the feed-in tariffs. The timeframe of the project was also determined by feed-in tariffs, which are guaranteed for 20 years, while the business model and decision-making organisation were designed to ensure reactivity and efficiency, so as to be able to seize the opportunity the tariff before it was reformed out of existence.

A firm (SAS Ségala Agriculture et Energie Solaire) was created specifically for the project. Its shares were owned by roof owners willing to take part in the project (who brought in 20% of the amount needed to equip their rooftops with PV panels) and by the Fermes de Figeac cooperative, who also provided staff. The SAS would rent the rooftops, hire a firm to provide and install PV systems on them, take care of all the administrative procedures for everyone, sell the electricity produce to Electricité de France (EDF) within the framework of the feed-in tariff schemes, and pay dividends to its shareholders. The rest of the funds required were negotiated with banks. The project was expected to yield mean net profits of 20 euros per square metre of installed PV per year over 20 years (with a phase of investment, a phase for loan repayment and a phase of net profit). The resource and profits were thus mutualised: all rooftops were aggregated regardless of location or grid connection costs (though some were excluded because their bad location or high grid connection costs would reduce the project's overall profitability by too much), and costs and gains were divided according to installed surfaces (and not the actual electricity produced by each installation).

Though the project was in many ways an innovation, and involved the creation of an ad hoc firm, it did not just build on the guarantee of feed-in tariffs. On the contrary, it took firm root in the territory's resources and, mainly, on the existing capacities of the cooperative. The strength of the Fermes de Figeac was to assess and combine its existing assets quickly, and to convince partners and funders of their value in the context.

The first, most obvious assets were the rooftops themselves. For the most part, they were the roofs of agricultural buildings and sheds, and thus already had their own utility and economic value. The possibility of using them to install photovoltaics offered an opportunity to graft new sources of utility and values onto this existing capital—although it involved legal and administrative transformations (Cointe 2014, 2016).

In addition to appending itself to capital assets used for other economic activities, the project built on the Fermes de Figeac's networks, staff, know-how, expertise and capacities. The SAS Ségala Agriculture et Energie Solaire was grafted to the Fermes de Figeac in many ways (and this close interlinking required negotiations and persuasion): the majority of its shareholders were members of the cooperative; its administrative board was partly constituted of members of the Fermes de Figeac's own administrative board, and its President was that of the Fermes de Figeac; and its workforce was staff employed by the Fermes de Figeac. It was an emanation of the cooperative, designed to provide a specialised and highly reactive strike force.

These strong ties with the Fermes de Figeac provided assets that were critical for the success of the venture. It provided access to the resource: the cooperative advertised its project to its members, and farmers joined in large numbers because they trusted the cooperative, and preferred to embark on a cooperative project with a well-recognised local actor rather than engage in PV projects alone or with firms they did not know. It also benefited from less material resources. First, the cooperative had been following the evolution of renewable energy policy for over a decade, and had good knowledge of the policy landscapes and possible projects for such a rural area. This expertise was crucial in enabling it to react quickly to the feed-in tariff incentives: they were equipped to do so because they had been monitoring the relevant requirements for some time. Second, as a well-established actor in the local rural economy, the Fermes de Figeac had developed a network of connections with territorial actors and institutions, and, crucially, had obtained their trust. This clearly facilitated contact and negotiations with banks and administrations. Individual actors in the project also brought in their skills in rural development projects and collective organisation.

These assets were crucial for developing the business model, for constituting a collective form of agency to carry it forward, and for enrolling partners. However, the project also encountered barriers and challenges that were unprecedented for the cooperative. These stemmed in part from the fact that it had little experience with energy projects, and had never worked with actors such as Tenesol (the PV system provider and installer) or EDF-AOA (the branch of EDF in charge of purchase obligation contracts, with whom it was virtually impossible to establish direct working relations). But most importantly, they originated in the financial scale of the project: the total investment was over 30 million euros, and required the involvement of a syndicated loan as well as national banks. For these purposes, the assets and guarantees that the Fermes de Figeac brought forward were definitely not enough.

The cooperative had approached the banks with its project already fully designed, considering that the work of evaluating, pooling and smoothing out risks had been performed in the development of the mutualised model. Installation sites had been selected, and mutualisation was designed to guarantee that malfunction in one or another installation (e.g., payment delays, installation failure…) would, on the whole, be compensated by the rest. The banks, however, would not directly accept the mutualised project as a whole. They proposed instead to divide the project into about 100 separate projects, to be processed individually through their own risk analysis procedures. The Fermes de Figeac refused and succeeded in getting the banks to approach the initiative as a single collective project, assessing risks first individually and then globally, thereby un-pooling and then re-pooling them.

The negotiations with banks thus involved a lengthy reassessment of assets and risks, each separate installation being audited individually. The banks were largely unwilling to take mutualisation—a crucial element of the business model—into account as a guarantee in itself, and the collective project was disaggregated and re-aggregated within their risk assessment procedures.

Since the Fermes de Figeac had never worked on a project of this financial scope, or negotiated with banks at the national level, this part of the project involved a lot of learning on the go. In that sense, new capacities for economic action emerged through this attempt to harness and mutualise this solar resource that had been made profitable by feed-in tariffs. As mutualisation expanded the scope of the project and complicated the negotiations, it also to an extent led to the development of enhanced capacities. The project's success created additional assets: profits to reinvest, networks and expertise in the field of renewable energy, new competencies in negotiating large-scale projects (and, conversely, a new expertise for the bankers involved in the syndicated loan, most of whom had never worked with PV before), knowledge of the solar potential of the territory and know-how in the management and maintenance of photovoltaics… In that sense, it succeeded in bringing innovation through a market. Of special interest here is what mutualisation through the cooperative achieved. They bent banking practices, forcing banks to accept and consider mutualisation as part of a project much larger than is usual. They also modified the individual incentive of the tariff by pooling the resources (regardless of their location or grid connection costs) and sharing benefits according to installed surfaces (rather than the actual electricity production of each installation). Through this project, the Fermes de Figeac emerged as a new player in renewable energy development. But this project can also be read as a reinforcement (and renewal) of existing capacities. It strengthened the position of the Fermes de Figeac as a central actor in the area, and contributed to the revitalisation of a rural territory where agricultural activities are on the decline. The project, with all its innovative qualities, is also presented by its promoters as a means to preserve territorial economies, activities and landscapes that are threatened with disappearance if new resources are not developed. In other words, innovation here was intended to support preservation and conservation, instead of replacement and change.

In this second case study, we thus have the farm roofs of an agricultural cooperative gaining an extra role, that of collecting sunlight to transform it into photovoltaic electricity. Alternative new actors entered a field that was new to them (energy production) through a feed-in tariff. As in the first case, they capitalised on an existing network of relationships and on a state-supported mechanism. However, these actors also bent actual market practices: they forced the banks to reconsider their way of calculating risk, and insisted on modes of calculation that foreground the collective, and not the individual level. Three conditions seem to have been decisive in enabling the PV cooperative to make a traditional market actor such as a bank reconsider its usual practices, however fragile and provisional the change might be. First, the Figeac collective at work is well structured and speaks with a single voice. Second, the collective is supported by a state subsidy (feed-in tariff) that is guaranteed for an extended period, which endows it with a secure business model in the eye of the bank. Third, the arena in which the transaction with the bank is negotiated is small, and allows for the representatives of the collective to make themselves relevant. The result is that, in this case, what Çalışkan and Callon (2009, 2010) called the prosthetic *agencements* of the market—the set of ready-made available values and practices on which valuation can rely in order not to have to fully begin from scratch—are bent, and allow for the politicisation of a transition process. A transition process initially intended to proceed through mere market mechanisms thus allows for a collective concern to come to be acknowledged and to structure the process.

This case study clearly illustrates the fact that here, passing through markets in the pursuit of a political end (energy transition) succeeded because the actors concerned with these ends were empowered by the market devices that were put in place. The empowerment of these actors, however, was not a direct effect of the process of market creation. Instead, these actors were already constituted before the development of the market. However, the market supplied them with resources to extend and sustain their collective action.

5.3 Smarting the Grid: From the Responsive to the Captive Electricity Consumer

The 'consumer' is a relatively new character in the electricity sector. This character, who is closely associated to the process of market liberalisation, has become a key subject in EU energy policy in recent years. Two directives have promoted both the consumer as the key actor in energy policy and smart meters as the way to allow consumers to hold this key role (directive 2006/32/EC and directive 2009/72/EC). We choose to characterise the vision of the consumer that is put forward in these directives as one of the 'responsive consumer'. 'Responsive' echoes the term 'demand-response', which is used by actors in the electricity sector in order to point at the possibility for electricity demand—and thus for the electricity consumer—to become reactive to price signals. This reactive consumer is amenable to price incentives, to contributing to peak load sharing by shifting his/her demand and uses in time, thus taking part in the balancing of the electricity grid. 'Responsive' also echoes 'responsible', which refers to the integration of environmental concerns in the conduct of everyday life. The 'responsible' part of the responsive consumer disciplines itself to taking care of its energy consumption. The responsive consumer might thus also respond to other non-price signals such as grid congestion signals, signals for non-wind generated or polluting electricity, etc.

In the energy sector, the 'smart grid' is the key techno-economic object that supports the construction of the responsive consumer. The term designates a bidirectional grid, conveying both energy flows and real-time information in both top-down and bottom-up directions. In technical terms, this has to do with the electricity grid being rewired to incorporate a telecommunication network. On the consumer end of the grid, this can translate into devices ranging from home displays showing real-time electricity usage, electricity rates, or grid status, to fully automated smart homes whose heating and air conditioning systems, washing machines, blinds, fridges and freezers could be remotely controlled by their inhabitants or the grid operator. Governments, energy companies and manufacturers have made large investments in smart grids in both Europe and the United States.

In France, one particular episode in smart grid development resulted in 'responsive' consumers being turned into captive consumers, dependent on a smart box provider to pilot their home equipment and electricity provision. Paradoxically, the process, whose story we briefly sketch out below, was all carried out in the name of liberalisation and market choice (for a more detailed account, see Grandclément and Nadaï 2015).

A turning point in smart grid/smart home development in France was the decision to make the electricity meter the obligatory gateway of the smart home. A large-scale smart meter roll-out was announced in France in 2008, with the stated aim of installing a new meter in every French home by 2017. At first, smart home projects and smart meter roll-out proceeded independently, although possible synergies between the two were sometimes sketched out. Smart home projects were supported through 'demonstration projects' financed with public funds; calls for tenders were issued. In June 2011, at a moment of heightened criticisms of the smart meter project and while promoters of the project raced to speed decisions on its deployment, there was a new call for tenders for smart grid demonstration projects. This call included the incorporation of the smart meter as an obligatory point of passage for projects focussed on the demand side of the electricity system.

As a consequence, smart home projects now had to pass through the French smart meter. This involved a redesign of both the meter and smart home projects. While smart home projects relied on home boxes wired to the internet to communicate with home appliances, these boxes now had to physically fit into the smart meter. For technical and practical reasons, this considerably narrowed what could be done. A major limitation was that there was only one physical space inside the meter into which a device able to communicate with the grid, the energy provider and home appliances could be inserted. Intense techno-political struggles ensued over defining who would be able to put their hands on this device and for what purposes. Importantly, the device could be used either to manage home appliances (remote control function) or to carry information about grid status, electricity price and electricity usage (information carrier function) and since there is only one space inside the meter, these two functions are mutually exclusive. The arena in which this negotiation took place gathered a large set of actors including the grid operator, the energy regulator, energy providers, the energy and environment ministries, the environment agency, the energy ombudsman and other interest groups, including representatives of organisations involved in smart grid demonstration projects. One important dimension of the negotiation was the technical complexity of the issues at stake. They concerned the capacity of the meter to circulate and/or compute multiple sets of data, as well as its articulation with both the electrical grid and future intelligent home appliances (we cannot explore these negotiations in detail here due to space limitations, but see Grandclément and Nadaï 2015).

To sum up a long and intricate techno-political discussion, of the two functions of the smart meter—that of information carrier and that of remote control—the first lost and the second won. By threatening to pre-empt the one potential communicative control interface with the smart home, the information carrier function was clearly threatening downstream smart home market development possibilities. Exit then the 'responsible' part of responsive consumers, who would pay attention to the levels and timing of their electricity consumption so as to play their part in avoiding grid congestion, minimising socio-technical recourse to grey electricity and maximising recourse to green electricity.

What, then, of the other part of the responsive consumer: that is, the reactive consumer who takes advantage of market competition to choose between offers and acts according to price signals? There were two issues here. The first was the smart meter's ability to transmit real-time price signals to the smart home, so that consumers and their technical delegates can choose whether or not it is worth it to start the washing machine now. It turned out that the meter was not allowed to have prices pass through it because of the 'unbundling doctrine', which is central to the liberalisation process in the electricity sector. According to this doctrine, competitive activities (such as electricity provision) must not be mixed with non-competitive activities (such as grid operation) in order to ensure that all actors are equally able to compete. On these grounds, the French energy regulator ruled against allowing the smart meter (which belongs to the grid operator) to transmit and record actual electricity prices (which pertain to market coordination). In order to transmit prices in real time to consumers, prices had to transit through a route other than the meter. It was thus decided that energy providers should offer consumers (almost) real-time access to electricity prices, and that the meter could only be programmed with a price hierarchy: not the exact price, but an ordered list from the cheapest to the most expensive.

The second issue was the question of the hardware needed to operate a home according to real-time price signals. This issue related to the techno-economic configuration of the aforementioned device placed inside the meter that would talk both to the consumer and to the appliances while taking electricity rates into account in deciding whether or not to allow the electric oven to function. Since there was only one slot in the meter and since the device placed there only had the remote control function meant that whatever actor lodged their own device in the meter gained a de facto monopoly on the market. But this possibility was closed down with an argument, echoing the last Energy Efficiency Directive (2012/27/EU), which precisely stipulated that the smart home market had to be open to competitors. In short, smart electricity consumers—here envisioned as choosing among options on a market—should be presented with multiple offers in order to be given the chance to express their optimising potential and drive market competition towards a socially efficient configuration. Concretely, the presence of a smart home box subject to competition, supported by private business models, installed downstream from the meter and communicating with it, was thus required as a guarantee of a competitive environment.

Ultimately, and as of we conducted the fieldwork, the process ended up with the following configuration: the slot inside the meter pertains to competitive activities within the market; the device installed in that slot receives a price hierarchy from the non-market meter that it transmits in turn through a 'wave system' (to which any device, appliance or box can connect itself), downstream towards the home, to pieces of equipment such as energy management boxes that control appliances. Energy management boxes are to be developed by energy providers, home equipment industries, or telecommunications specialists. Consumers could choose on the market which one to buy. In this final configuration, in principle, consumers can choose a box and a rate separately, and programme the box so that it can decode the price hierarchy provided by the meter. In practice, however, the energy provider (who knows the prices) would be much more able to perform this assemblage of a rate and a box than either the end-user or any other intermediary.

Such an assemblage amounts to bundled offers with elaborate electricity rates, an energy management box and perhaps a 'smart' thermostat, app or display. Such a 'bundled' offer could include, for instance, a rate of this type: price A during daytimes on weekdays except from 6 to 8 pm; price B from 6 to 8 pm weekdays; price C at night on weekdays; price D in the daytime on weekends; price E at night on weekends; price F from 12 to 3 pm in summer; price G for major emergencies limited to 14 days a year; and a compatible pre-programmed box that would allow the consumer to draw the most 'benefits' from that rate.

In such elaborate service bundles, market actors can render the cost of the smart grid equipment invisible to the final user, as it is diluted in the costs of the broader smarting of the home. The provider also maintains some power over the consumer. The reactive consumer is in reality 'captated' in the sense of Trompette (2005) and Cochoy (2007)[10]—lured and held, in a manner of speaking. In other words, although it is always possible in principle for a customer to change supplier, in practice doing so is very difficult.

In the end, here the abstract economic doctrine of 'unbundling' is countered by concrete techno-material marketing efforts resulting in twists in and obvious contradictions of that doctrine. The most telling of these contradictions is that in the name of 'the' market, prices are not to be readable from the meter. The unbundling doctrine is not realistic enough to counter concrete market-making practices, which culminate in a form of 're-bundling': not of the grid and the supplier, but of the supplier and the consumer. The figure of the consumer who is inscribed within the techno-material ecosystem of the meter is of a semi-captive consumer.

In this third case, we are thus faced with an unbundled electricity system, intended to sustain a market space, which is re-bundled at a lower level, with the consequence that the consumer is 'monopolised'. There is no direct subsidy to help launch a modernised retail electricity market, but a system of 'demonstration projects' that are provided with repayable advances (see Chapter 7 on demonstration). Actors struggle to defend their own interests, but the nature of the future market is unclear. Importantly for our purposes, the arena in which the shaping of this market is debated and decided is marked by asymmetries of information and power, which clearly mirror the strategic dimension of the 'demonstration' projects and policy. The unbundling doctrine, which is supposed to grant fair and free access to the future electricity market, depends on a representation of this market as a clear-cut thing with clear boundaries. However, the boundary is not a line but a zone of struggles, devices and negotiations about where lines should be drawn. Market actors want to expand the market in order to increase the scope of their business models. They navigate with and through devices, whose technical complexities become decisive in drawing boundaries. It might also be that public actors expect smart home development to be supported by the market, so that its costs neither appear to be imposed by public administrations nor to bear on public budgets. The 'captated' consumer might not represent a deliberate end in this story, but only a kind of collateral damage. Nonetheless, the surrender of the responsive consumer speaks to the limited reach of the process with regard to both energy change and participation.

In contrast to the first two case studies, here the devising of the market was tied to a dialogical space in which the dominant actors end up being those who were supported by the very policies that call for an outside of the market in order to regulate its design. This circularity highlights the complexities involved in passing through markets for political ends: the actors placed in charge of developing these markets end up being engaged in multiple valuation processes, which can confer dominant roles on these actors and divert the markets from the ends they were initially intended to serve.

5.4 Valuing Non-consumption: Decoupling Erased kW from the Market

This case study deals with a contested attempt at developing distributed load shedding for the electricity grid in France. Load shedding consists in reducing electricity consumption at a given time in order to achieve grid balancing (and thus to avoid incidents such as brownouts or blackouts). This case study is strongly connected with the previous one, as it also deals with the development of novel ways to modulate electricity consumption according to grid or production needs. While the previous case study considers the development of business models, electricity rates and physical equipment at the home level, this case study examines the efforts of one specific actor to value load shedding on the wholesale electricity market.

Distributed load shedding involves aggregating the load shedding actions of consumers connected to the electricity distribution network (mainly cutting off electric heating installations). This service—that is, an 'erased' kWh—can then be sold to grid operators in order to help them manage the real-time balance between production and consumption in the power system. Load shedding operations are activated through in-home boxes remotely controlled by an operator. This operator contracts with final electricity consumers, who agree to allow certain home appliances to be disconnected within certain timeslots, when needed by the operator.

In France, a private firm (Voltalis) has been pursuing this business model since 2007. Voltalis started by installing devices in private homes that can interrupt electric and water heating at peak times. It did so outside of the smart meter project and without using market devices such as price signals to encourage users to increase or decrease their electricity consumption at a given time. The only compensation offered to the final consumer in its business model for load shedding is the electricity savings they obtain through the deactivation of the devices.

Voltalis is able to supply the erased kWh on what is called the 'Balancing Mechanism' (BM), managed by the national Electricity Transport Grid (Réseau de Transport d'Electricité, or RTE) operator. The BM is defined by the transport grid operator as a 'permanent and transparent system of calls for tender' or a 'market' in which kWh are sold and bought. This system operates separately from the day-ahead spot market, where producers and retailers exchange electricity in order to supply their customers. The BM provides a real-time reserve of power that the TSO can use to balance the grid, when market actors do not meet their own balancing requirements. Offers are remunerated on a pay-as-bid basis.

As Voltalis's activity expanded, controversy arose as to the status of the erased kWh that Voltalis was selling via the BM. Some participants in the mechanism argued that Voltalis should compensate the provider of the kWh that it was 'erasing'. The providers, by contracting as an electricity provider with a customer (who then contracted with Voltalis), had committed to deliver—inject into the grid—the kWh consumed by each of their customers. Electricity providers are obliged to do this by the terms of their commitment to maintaining the equilibrium of the market, and to do so prior to the moment when each kWh is expected to be consumed. In turn, while its business was dependent upon this delivery, Voltalis's activity also resulted in a net loss for its customers' regular electricity provider. In response, Voltalis argued that since this kWh had not been consumed, there was no reason for it to be compensated: asking for compensation was just a way of hampering the emergence of distributed load shedding as a genuine alternative to electricity production in the grid. Load shedding and kWh production should be considered as purely symmetric solutions from a grid balancing and a TSO viewpoint, so there was no reason for the former to compensate the latter. So went the argument.

The first move of the electricity regulator (the Commission de Régulation de l'Énergie, or CRE) as a reaction to Voltalis's activity was to apply a pure market framing to distributed load shedding, by incorporating it into the BM. However, considering that Voltalis simply sells a kWh to the BM logically implies recognising that this kWh was produced by a provider. It is not our purpose here to detail the actors involved, the process and the technicalities of the arguments (for more detail see Reverdy 2017). However, what seems important for our purposes is the course that the controversy followed. It began in a technical and regulatory arena within the CRE: highly technical discussions were organised in a grid-related expert group—the CURTE (Comité des clients utilisateurs de RTE [Committee of electricity transport grid user-clients]). It then moved on to a legal-political body, the Council of State (Conseil d'État), where the decision of the CRE and its legitimacy to arbitrate this issue were challenged. Finally, it moved into the political arena (the French parliament). In all three of these arenas, market framing categories failed to resolve the controversy and stabilise a consensual valuation framework and process. Two different market solutions were explored: the BM (short-term balancing) and the capacity market (added capacity in order to assure the balancing of demand and supply) in order to try to induce Voltalis to shoulder the full burden of its membership in the collective organisation of the power system. Both failed to provide distributed load shedding with a consensual valuation framework and a viable business model.

Eventually, an alternative approach succeeded in temporarily stabilising a framework. In 2013, under a new law, a repayment per kWh (to its provider) was imposed on Distributed Load Shedding (DLS), but DLS was also deemed worthy of subsidy 'in order to account for the advantages of distributed load shedding for society' (Loi Brottes, 2013). In this new approach, which departed from a pure market framing, the value of distributed load shedding rested on its contribution to social welfare. An assessment of the social benefits of distributed load shedding was commissioned, but the principle of the subsidy was soon contested by many actors, including other industrial load shedding operators, on grounds that it could distort competition. In 2015, in a context including new entrants, the French government reasserted a non-market approach to distributed load shedding in a new law. A national call for tenders was issued in order to support distributed load shedding 'as necessary in order to allow for its development'. Several justifications were offered in support of load shedding activities, including their contribution to reductions in electricity consumption (not only its postponement) and to consumers' management of their electricity consumption. With this change, distributed load shedding was no longer conceived as a regular market and business activity, but as an emergent solution worthy of state support because of its potential social benefits—in the same way as renewable energies had actually been conceived and regulated. Under this new framing, several incumbents in the electricity sector began their own distributed load shedding activities. While supported through a call for tenders, distributed load shedding had to compensate for the production of the kWh it erased. This mechanism was justified by treating load shedding as a type of 'reserve capacity', replacing existing peak load power.

Despite its top manager's strong connections with the French political arena, Voltalis failed to impose the total equivalence of distributed load shedding within market coordination with electricity production itself (under the BM). While it gained financial support as well as the possibility to carry on with its development, it failed in its attempts to avoid being required to compensate the producer of the kWh it erased, and to see its ideal business model—based on a recognition of a symmetry between a megawatt (producing a kWh) and a negawatt (erasing a kWh)—validated. This business model would have threatened the current organisation of the electricity market. In it, Voltalis would rely on the BM and benefit from the ongoing responsibility sharing in this market organisation (at the moment of erasing, Voltalis *counts on* the 'to-be-consumed' kWh because providers are *committed* to the collective organisation of the grid), without acknowledging this codependency and accepting to pay due contributions to this collective construction (not wanting to contribute to the cost of this granted kWh). In other words, the mega- and negawatt as framed by Voltalis were not symmetrical, because only one of them (the megawatt) recruited the full set of relationships underlying the organisation of the BM. Whether or not this set of relationships was necessary to the functioning of the electricity market was a core question that remained unaddressed. At least, it was not answered in Voltalis's vision, which thus did not represent a full-blooded alternative.

Instead, Voltalis's business model ended up being redefined as an emergent one worthy of state support, and the organisation of the BM was kept unchanged. Incumbents joined Voltalis in this emerging sector, but as it was based on a distinctive, partly isolated mode of valuation (the tender mechanism) and required compensation for erased kWh, it no longer distorted the organisation of the BM. While distributed load shedding was made part of the ongoing energy mix, it was treated as a *potential* (future) alternative to energy production.

In the end, the controversy was not resolved. There was no consensual clarification of the value that should be assigned to distributed load shedding. As emphasised by Thomas Reverdy (2017), attempts to do so have alternated between an economic valuation dominated by market pricing, economic equivalence and uncertainty about future demand, on the one hand, and a political valuation in which it is valued in terms of its benefit for society, on the other hand. Market practices and theories have contributed, through successive valuation proposals, to isolating the valuation of distributed load shedding from the existing electricity market and to clarifying the extent of financial support for it. But the present case study mostly points at the limits of markets in sustaining innovation. The institutional instability of distributed load shedding seen here resulted from the fact that its integration into the electricity market caught it up in a set of abstract economic arguments and qualifications leading to ambiguities and uncertainties, resulting in a politicisation of the surrounding debates. Importantly, we can relate the controversy about the erased kWh and their compensation (or non-compensation) to the way in which the electricity market is organised materially as a way of scaling up market exchange. All kWh are made the same when injected into the grid (see Chapter 2 on resources). Both their origin and their property status are blurred. Only computer certificates bear witness to inputs and outputs. While these inputs and the outputs are thus attributed to particular actors, the appropriation of kWh within the grid remains pending, making it all the more difficult to address compensation issues.

In this fourth case study, we are thus faced with a particularly intricate and elusive market. Here, in contrast to the previous case studies, a newcomer, who is very well-connected in high political and regulatory circles, originated an innovative proposal for passing through the market, but only partially succeeded in introducing novelty. Distributed load shedding came to be recognised and financially supported in order for its development to continue—outside the market. Market practices, organisation and categories fell short of taking charge of this novelty and promoting decreased consumption, which would be good for the energy transition in any case. In some ways, in this case study, market fought market. Voltalis's framing of the kWh was an attempt at making the BM's kWh lootable, by detaching it from the process and the web of commitments that underlay its provision on this market. In this case study, distributed load shedding and the BM fought one another for recognition as legitimate market activities. Like the previous case studies, this confirms the decisive importance of incumbents when passing through the market is used for political ends, and underlines the contrast between the widespread view of markets as a level playing field and the complex realm of market-making practices.

6 What Happens to the Energy Transition When It Passes Through Markets?

Unsurprisingly, the four cases presented here do not offer a unified view of 'the market'. Instead, they represent several types of market devices, including devices for monopolisation and a case of failure (no market can be sustained for the erased kWh within the general market organisation of the electricity sector). These case studies support the idea that there is much to gain by entering into a fine-grained analysis of actual market devices. They illustrate ways in which markets can lead to positive or negative outcomes with regard to both energy change achievements and participation in steering these changes. They confirm, if confirmation was needed, that the market alone does not have a definite orientation. Far from the ideal of a level playing field, markets can be a way to differentially empower particular actors. The way in which actors are offered access to and empowered (or disempowered) in the arenas where markets are designed is decisive for what the resulting markets can achieve. The case studies illustrate diverse configurations and reasons behind the contrasting achievements of markets in relationship to the energy transition and to who is empowered to contribute to its steering. Markets can be politicised, as in the case of Figeac, in which local actors structured themselves in order to act for the transition *and* were empowered by State support (the value of the feed-in associated with their project) in the closed arena in which they negotiated their access to credit. Market design can also rely on an asymmetric access to information about the objects to be traded (e.g., tree stumps in

Aquitaine as a biomass resource) or about the devices underlying this design (the French smart meter case study), which results in power asymmetries in market design. The way in which markets are scaled up (the way entities are made the same to be traded on a larger scale) might also impose limits on what markets can do, as illustrated by the case of distributed load shedding. Indeed, in this case, the new entrant showed political will and power in the face of incumbents, but its claim to have the right to appropriate a kWh and sell it could not be cleared up, partly because the way the electricity market is scaled up blurs the appropriation of the kWh circulating into the grid.

One conclusion that is clear from these case studies is that markets are not inherently either good or bad for the energy transition, but that their affordances are of crucial importance to what actually becomes of energy transition processes—affordances here meaning what they offer as novel possibilities for new actors to form and to act. These affordances depend on the configuration of the market devices, and it is very notable in our case studies that the state plays a central role in the processes that configure these devices. In other words, the state retains a great deal of power in devising market devices. That being said, even when the state has a definite political will, it might be that marketing strategies—defined as the sophisticated practices of market making—are stronger than generic political ambition, because they are better anchored in the actual material workings of markets (as attested by the French meter case study) and they are thus in a better position to steer them. As a consequence, while political will is a precondition for 'civilising' the market, it is not a sufficient one.

In the introduction of the book, we defined relevance as the possibility, for entities that are concerned with an issue, to succeed in being acknowledged in the processes or arenas where the issue is to be addressed. Market studies have gone further in the analysis of relevance and of markets' capacity to take charge of concerns. Drawing on several strands in market studies, Geiger et al. (2015b) point at three ways in which markets can address concerns. The first, to 'refer, relate to', is when the framing of actors and entities on which market exchange relies, as well as the underlying order of worth, are challenged and debated. These have been termed ‘hot situations’ (Callon 1998a; Callon et al. 2002). In these cases, the ‘cut’ of the market is challenged, with market-external relations intruding into the market order and setting it in motion. In the second, defined as ‘affect, influence’, concerns relate to the way in which hot situations are taken charge of through settings such as ‘hybrid forums’ (dialogical spaces where matters of concern can be identified and debated: Callon et al. 2009) or ‘heterarchies’ (corresponding to local settlements which allow for the articulation of multiple common goods: Stark 2011). The idea here is that markets can be civilised by incorporating concerns. The third way in which markets can be concerned is defined as ‘trouble, worry’, and corresponds to situations in which controversies persist and take on a political dimension. Here, actors denounce the ways in which the shaping of the market supports dominant interests, and attempts are made to concern others in order to reframe the way in which a market has been shaped.

Our case studies can be placed in this framework [arrows point to the displacement of the situation in the course of the case study] (Table 1).

Table 1 Markets and concerns in the four case studies

	Concern		
Case study	**‘Refer, relate to’** (‘hot situation’, challenging market framings of actors and entities) - **Setting markets in motion**	**‘Affect, influence’** (taking charge of ‘hot situations’, ‘civilising’ markets through dialogical spaces) - **Incorporating concerns into markets**	**‘Trouble, worry’** (controversies taking on a political dimension, denunciation) - **Controversies around market framing taking on a political dimension**
Aquitaine biomass	• ⟶	⟶	⟶ •
Figeac		•	
French smart meter	• ⟶	• ⟶	•
Demand Load Shedding (Voltalis)	• ⟶	• ⟶ ⇠ – – –	– – – • (dashed arrow pointing back from ‘Trouble, worry’ to ‘Affect, influence’)

What our case studies show is that in reality it is quite challenging to realise the alleged possibility of 'civilising' markets through dialogical spaces, as it may replicate power asymmetries present in markets, albeit for different reasons. In one case, it is because the dialogical spaces proved to be asymmetric due to the absence of genuine counter-expertise on the entities under consideration (smart meters). In this case study, in which passing through demonstration and demonstrators structured the expertise, the dialogical space somewhat replicated asymmetries present in the ongoing shaping of the market. Here, strategic information and learning was almost exclusively in the hands of actors with an interest in developing the solutions under consideration (see Chapter 5 on demonstration). In other terms, because (informational) asymmetries largely overflow the market, seeking footing outside of the market to create dialogical spaces where it can be repaired is problematic. In the other case (distributed load shedding), market shortcomings resulted from the ongoing socio-material shaping of the electricity market, which does not allow claims about the appropriation of electrons in the flux to be sorted out. While the politicisation of the issue yielded a workable status for distributed load shedding activity, this status took distributed load shedding outside of the market (rather than reframing its market). Thus, in this case again, the market was not really 'civilised'.

Both cases challenge the idea that dialogical spaces can easily constitute an exterior to markets and a form of recourse capable of correcting and civilising them. This is especially true in the current period, in which policymakers strongly believe in the virtues of the market, and tend to empower market actors in the development of new technologies, notably through demonstrators. This results in a situation in which the knowledge needed to challenge emerging markets is in the hands of those actors who have an existing interest in developing these very markets.

The role of the state in structuring such an exteriority to the market—hence making it potentially 'civilisable'—is key (Figeac PV project) but multiple. Our case studies show that the state sometimes does not formulate political ends nor acknowledge the processes of market making (tree stumps in Aquitaine); sometimes finds itself unwillingly involved in the intricacies and complexities of these processes (French load shedding); and sometimes is itself the actor that blurs the frontiers, because it sustains the emergence of the same market actors that it empowers in the dialogical spaces (French smart meter).

7 Conclusion

Our goal in this chapter was to examine the now-frequent association of markets and market shaping with the conduct of energy transition processes. We did so using a set of case studies on energy transition processes in France, which we analysed through the lens of economic sociology, paying attention, where possible, to the devices and the fine-grained working of markets.

Our case studies revealed a series of market-like devices, rather than substantive market forces. They offer a contrasting view on market-based energy transition processes—one that is perhaps hopeful, but that invites care and caution when relying on markets to pursue energy transition goals. On the one hand, conducting the energy transition through market-based valuation principles could mean a 'fossilisation' of renewable energies (Raman 2013), as well as energy accumulation instead of transition (Bonneuil and Fressoz 2013). Our case studies show that this might well be the case in certain configurations. For instance, the tree stump case study shows producers attempting to 'fossilise' the Dordogne wood resource in order to get a hold on it. On the other hand, this should not be taken as a generality: market devices can also present opportunities to act and to intervene, as illustrated by the Figeac case study.

The results of our case studies thus run counter to the widespread assimilation of markets to a 'level playing field' that can foster innovation and 'fix' our energy problem. They suggest instead that the outcomes of attempts to pass through markets are uneven with regard to both the development of new solutions for the energy transition and the extent to which these can be steered democratically. Markets per se do not exist, neither do they have a specific orientation. Their potential in relationship to the energy transition very much depends on what we attempt to achieve with them.

What also appears quite clearly in the four cases is the complicated work involved in defining and shaping market participants: buyers, sellers, goods to be exchanged and even the marketplace. It is not enough to calculate the energy content of tree stumps or the exposed surface of photovoltaics. In order for a market to take hold, these dimensions must be articulated to what already counts for the actors. This opens the door to the valuation of things other than what the market usually recognises as valuable. This underlines the complexities involved in instrumenting markets for the energy transition, and should stand as a warning against an overly instrumental take on markets. On the one hand, clear-cut cases such as Figeac or Aquitaine biomass, each in their own style, foreground the decisive importance of public policy in empowering certain actors and offering them the opportunity to bend market processes for better or worse. They suggest that there is nothing we cannot achieve with markets, if we clearly and carefully work to achieve it. On the other hand, more ambiguous cases—French smart meters and distributed load shedding—foreground the complexities involved in working with markets to achieve political ends.

The possibility has been advocated of addressing concerns and political ends through markets—'civilising' them—in various ways, such as attaching them to dialogical settings in which multiple common ends can be articulated. Our analysis suggests that this potential depends on the assumption of an exteriority and otherness to the market. Gathering and assembling such an exteriority may be difficult when institutional power, expertise, and the information required for valuation processes are in the hands of the market actors to be challenged. The possibility of 'civilising' markets requires setting up the conditions needed to assemble an otherness to a market framing (e.g., counter-expertise, access to knowledge, availability of non-market parties…).

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Notes

1. EU, 1997, Communication from the Commission, Energy for the Future: renewable sources of energy—White Paper for a Community Strategy and Action Plan, COM (97) 599 (final), 26 November 1997, Brussels.
2. EU, 2000, Commission Européenne. Communication concernant les politiques et mesures proposées par l'UE pour réduire les émissions de gaz à effet de serre: vers un programme européen sur le changement climatique (PECC).
3. EU, 2001, European Commission, Directive 2001/77/CE of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market. Official Journal of the European Communities, L 283, 33–40, 27 October 2001, Brussels.
4. EU, 2003a, European Commission, Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport. Official Journal of the European Communities, L 123, 42–46, 17 May 2017, Brussels.
5. EU, 2009a, European Commission, Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance), L 140, 16–62, 5 June 2009, Brussels.
6. EU, 2003b, European Commission, Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC—Statements made with regard to decommissioning and waste management activities, L 176, 37–56, 15 July 2003, Brussels.
7. FR, 2000, Loi n° 2000-108 du 10 février 2000 relative à la modernisation et au développement du service public de l'électricité. Paris.
8. FR, 2005, Loi n° 2005-781 du 13 juillet 2005 de programme fixant les orientations de la politique énergétique, JO n° 163 du 14 juillet 2005, p. 11570.

   FR, 2009a, Programmation pluriannuelle des investissements de production électrique. Ministère de l'Industrie. Période 2009–2020.

FR, 2009b, Circulaire du 19 mai 2009 relative à la planification du développement de l'énergie éolienne terrestre adressée par la Direction de l'énergie et du climat, Paris.

9. In the sense of preventing the entry of new actors into the sector and the development of different activities, such as the development of wood biomass products for domestic heating (small boilers).
10. Captation is a term coined by Cochoy (2007) to describe the strategies and devices deployed to influence, divert and manipulate fleeting and fluid collectives (e.g., citizens, electors, clients, consumers). It 'is a matter of having a hold over something that one does not, or rather not yet completely control' (Cochoy 2007, p. 205).

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