Exhaustible-renewable wind power

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Abstract

Wind energy is commonly thought as part of renewable energies. “Renewable” points to the idea that wind, being a flow-energy, is not exhaustible. In economic terms, it is thought as non-rival: harnessing the energy of the wind does not deprive others from the possibility of doing so. A corollary to this view is the pregnant and reifying idea that wind speed defines the potential for wind power development and production. In this view, the physical geography of wind is the only geography that matters in characterising wind power potential.

Our chapter builds on previous contributions pointing at the socially-constructed nature of wind power potential, in order to introduce the reader to a human geography of wind power. Drawing from a set of case studies of wind power development and a (theoretical) discussion of the socio-technical dimension of wind power technology and of various types of commons involved, assembled and re-composed in its development, we will challenge the idea that the “renewability” of wind energy is a matter of fact. Rather, we will defend the idea that only concern for the social and situated dimension of wind power development and due processes can endow wind with the property of being a renewable energy.

Keywords

Wind power – renewability – sustainability – commodity chain – France

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Introduction

Policy debates concerning the development of non-fossil energies have mostly been framed in technological terms, letting us believe that if we were to address and solve technological issues, alternative energy patterns would be at hand. Within this technological rhetoric, natural entities such as wind or solar radiation, which are commonly conceived as potential energy resources, have been quantitatively measured and mapped so as to assess the related technological potentials – e.g. wind power or solar PV production potentials (Gwh or GW).

As underlined quite a while ago by E. Shove (1998), this way of approaching energy issues casts a singular perspective on the development of energy technologies, because the social dimension is then conceived and approached as a social / institutional barrier to the realisation of a (pre)given technological potential: the possibility for social actors to take part into the construction of this technological potential is side tracked from the beginning on. More broadly, by conceiving such an abstract physical potential as a guide to energy change, it is a whole set of actual issues and of messy but decisive socio-material relations involved in the development of energy projects that are not properly accounted for. With them, it is the so-called ‘externalities’ and the sustainability – i.e. the social or environmental consequences - involved in changing our ways of dealing with energy(ies) that are not fully addressed.

Ready-made dichotomies such as ‘renewable’/ ‘non-renewable’, ‘non-fossil’/ ‘fossil’ energy, serve this state of affairs. They suggest that such a qualification mirrors a matter of fact, a natural qualification, instead of pointing to the rich web of socio-material relations and practices which underlay sustainability. The first category of energies (i.e. the ‘renewable’ and ‘non-fossil’ energies) is supposed to be sustainable, while the second is not (‘non-renewable’ and ‘fossil’ energies): wind or solar energies are sustainable; oil is not. Not to say that oil could be - it has never really been developed to be so. However, nowadays that so-called ‘renewable’ energy technologies and finance have been industrialised and globalised, the question of whether and under which conditions they are - or not - sustainable is a current and an actual issue. It calls for re-opening and exploring the ways in which we extract, concentrate, circulate and consume these energies: this is a task for a human geography of energy transitions.

This chapter builds on previous contributions pointing at the constructed nature of wind power potential, in order to introduce the reader to a human geography of wind power. Drawing from a set of case studies of wind power development and a (theoretical) discussion of the socio-technical dimension of wind power technology and of various types of commons involved, assembled and re-composed in its development, we challenge the idea that wind energy is renewable per se. Rather, we defend the idea that concern for the social and situated dimension of wind power development and due processes can endow wind power with the property of being a renewable energy.

The first part presents our approach. The second part presents cases of renewable and non-renewable wind power developments and draws up conditions for wind power to be developed as a renewable energy. The third part discusses these results emphasizing the importance of accounting for the material and relational dimension of wind energy.
1. Walking the hidden ‘worlds’ of renewable energy resources, entering a commodity chain approach

During the past decade, following and analysing the emerging wind power landscapes in France, we walked the field with civil servants and local inhabitants. If innovative solutions sometimes took place, local opposition to wind power also became vivid: it can be regarded as a symptom of this emerging energy world and its difficulties to generate genuinely shared dimensions.

One fieldwork, at the origin of our desire to write this chapter, was especially disconcerting: local inhabitants refused to be interviewed whereas they had agreed to so during a former fieldwork, two years before. Their refusal was justified by the turn taken by local wind power development, a process which they felt not to have any grasp on, and denying locally shared practices and values. Beyond the usual considerations about the impact of wind power, such a refusal faced us with the problem of its potential unsustainability. Wind power development could exhaust itself by affecting and exhausting for a long time the local energies. As stated by an interviewee: ‘you better not talk about wind power around here for at least a generation’.

If we are serious about such a testimony, this fieldwork experience shall call for a re-examination of the fundamental notions of ‘renewable’ / ‘non-renewable’. Wind energy is presented as a “renewable” energy because of the physicality and the characteristics of the wind resource: intermittent, yet flowing and abundant. This suggests that wind is unlimited and may be appropriated under free access. The development of industrial wind farms depends, however, on the use of other resources such as: land, electrical network, local actors’ involvement, local social synergies... These are limited. They may be held and controlled to a great extent by one or some individual(s). From this perspective, the appropriation of the wind is not free and might be better reflected upon by considering the assets engaged in its harnessing as a ‘bundle of resources’. This image is, however, only partially satisfactory. It suggests that the resources involved in the development of wind power are brought together in one place and on one single scale, which never is the case. The challenge is much more to investigate the long chain of institutions, groups and devices through which these resources are - or not - taken into account at different levels.

Several works in social sciences help us to face this challenge. Some point out the progressive fossilization of renewable energies as they are developed by historical energy operators and adapted to fossil energies institutions and infrastructures (Evrard, 2013; Raman, 2013). Raman also looks at the material supply chain of renewable energy technologies and underlines their increasing use in rare earths. Other works (Castree, 2003; Bakker & Bridge, 2006; Bridge, 2010) insist on the economical, social and environmental consequences of reducing energy resources to their physicality. Hartwick (1998) proposes a commodity chain approach in order to account for the consequences of transforming entities into commodities, from production to consumption.

These analyses suggest analysing further the full chain through which “renewable energy” is made available for use as an energy commodity in order to understand how far the notion of “renewability” may be considered as a part and a product of this commodification. One can, indeed, reasonably assume that the new economy of energy is framing the resource as an abstract flow - renewable per se-, for renewability not to be conditioned upon the complexities of the development of the resource. Laying bare the web of relations and entities as well as the transformations that are engaged in the process of commodification of wind energy, is a way to deconstruct renewability.

The notion of commodity and commodification has been developed in critical geography so as to highlight that the status of commodity is not intrinsic to the entities commodified - it is assigned - and this assignation has consequences. In particular, capitalist commodification has been broadly associated with a set of dimensions – not all being required – (Castree, 2003) such as: privatization – i.e. assigning rights to a named individual, group or institution -, alienability – i.e. the possibility for
the commodity to be physically and morally separated from their sellers-,

individuation –i.e. the representational and physical act of separation from a supporting context (water from its environment)-, abstraction – i.e. the qualitative specificity of a thing is assimilated to the qualitative homogeneity of a broader type or process (allows for instance for unproblematic equivalence, such as a wetland here is made replaceable by a wetland elsewhere)-, valuation – how things take on specific form of value (for instance, blindly profit-driven in capitalist society) -, displacement - how something appears as other than itself (spatio-temporal separation of production and consumption, so that you cannot see the exploitation of south African workers included in Italian handmade gold jewellery).

These dimensions suggest looking more specifically, in our case, along the chain from wind to ReN-kWh, at the transformations, attachment / detachment, framings, displacements of the resource in order to make into a consumable kWh. In order to do so, we approach wind power as a sociotechnical system. This means that looking at it as an isolated technical artefact is a fallacy, for it ignores the networks and collectives engaged in its production. Many works in the sociology of science and technology have contributed to highlighting this hybrid and ramified dimensions of socio technical systems (Akrich, 1988, 1989, 1993). These works are rooted in Gilbert Simondon (1989) approach to the co-genesis of technical objects and their ‘associated milieu’, seen as a comprehensive set of relationships that gives to this object a specific existence and effectiveness.

We approach the commodification of wind energy as a chain of transformations from the untamed kinetic energy of the wind to the consumption of a standard electric (‘renewable’ or not) kilowatt-hour. In a first approach, this chain may be described by six operational links: Depositing (turning the untamed wind into a deposit [a potential energy resource]) ≈ Harnessing (capturing the untamed wind) ≈ Extracting (the energy from the wind) ≈ Provisioning (entering the extracted energy into a provisioning system) ≈ Distributing (transporting the energy to the places where it is to be used) ≈ Commercialising (exchanging the energy for money with the final user).

Such a chain focuses the attention on the materiality of the (bundle of) energy resources, their changing reality while passing from one state to another, as well as on the collectives that are engaged in these transformations. In the case of wind energy, our proposal is to follow the transformations of energy from a state of heterogeneity and intermittency to one, homogeneous and stable, suitable for commercialisation, while describe the strategies and the rivalries through which emerging sociotechnical collectives try to take advantage of the possibilities (concentrations, accumulations, re-allocations...) offered by the chain. In the end, this will allow us to bring together in an encompassing view the ways in which the renewability of wind energy is (or not) hold stable in a context of locally contested sustainability of wind power developments (cf. supra).

Our empirical material is based on the analysis of the French wind power policy and of various local case studies (Labussière & Nadai, 2014), of which we focus here on three of them. This does not allow an evenly comprehensive examination of the commodity chain, because emphasis has been put on somewhat upstream links of the chain, at the level of the planning and siting of the projects (depositing ≈ harnessing). However, it allows for a critical examination of the entities included in or put aside by the construction of this chain and after all considered as externalities of the wind power policy. It also allows for a comprehension of the way in which the notion of “renewability” is hold as stable attribute of wind kWh in a context of contested, not always sustainable, wind power developments.
2. X-ble wind energy, a commodification account

Wind power is not exhaustible or renewable per se: it is X-ble, ‘X’ indicating that its fate and sustainability depends on how it is assembled. In order to explore this assemblage along the commodity chain of wind energy, we now turn to examining a few case studies, located in France, in the light of a commodity chain approach. We first consider the framing of wind power development by national policies. This allows us to cast light on how wind energy has been articulated with the current commodification of electricity – i.e. its construction as a standard kWh – and how “renewability” as an attribute of wind energy is constructed, stabilised and circulated along the commodity chain. We then turn to three different case studies of local wind power development. We follow the bundle of resources that are engaged into it and the way in which they are - or not - accounted for in this development.

2.1. French wind power

Since the end of the 1990’s, the European Union has endowed energy and climate policies with an unprecedented regulatory basis. In gradually implementing this regulatory framework, France has deeply modified its energy sector. It unbundled its former monopoly. It initiated a diversification of its electricity mix, by adopting a feed-in tariffs for renewable electricity (FR, 2000), by reforming its energy policy programing law (POPE law) (FR 2005, 2009a, 2009b) and by undertaking an unprecedented stakeholders consultation: the Grenelle Environment Forum (COMOP 2007, FR 2008, 2009c, 2009d). This resulted, among other things, in the adoption of medium-term objectives for ReN development and in a development of installed capacity.

Fig 1: Cumulated installed wind power capacity in France (MegaWatt)

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>48</td>
<td>873</td>
<td>5,979</td>
<td>7,821</td>
</tr>
</tbody>
</table>


On the aggregate, this upscaling of wind power, which is significant for France, has barely followed an economic rationale. It started with the most windy / profitable zones and progressing towards less windy / profitable areas. In some way, it was if constructed first and foremost as an economic resource in spite of much heterogeneity involved in the development of projects on the local level.

This development has leaned on the progressive structuration of a commodity chain which allowed for the conversion of untamed wind into a marketable ReN kWh. It was supported by the progressive adoption of a policy framework which first included as keys devices a feed-in tariff (2001) and an authorisation for electricity production² and grid connection. These two procedures framed French wind power as a privately owned/ privately developed activity and a grid connected form of energy production: private developers could benefit from a fixed price - a tariff higher than the price of the standard ‘non-renewable’ kWh - in exchange of each wind power kWh injected into the grid.

Grid injection imposes a physical transformation of the electrical current which comes out of the turbine. Horizontal axes turbines, the most developed technology, use large blades to harness the wind. When the wind blows, the blades are forced round, driving a gear system which allows a shaft alternator (1500tr/mn) to generate electricity. A transformer located in the tower of the turbine

increases the voltage up to 20kV for grid injection\(^3\). This physical transformation of wind energy underlay a change in the status of the electron. Once injected into the grid, it becomes part of the electrical flow like any other electron, renewable or not. The “renewable” origin of this electron is physically blurred. It would be lost, had a system of “guarantee of origin” been first set in place in 2006 in France, then updated (FR, 2012) and harmonised at the EU level starting 2009, with the adoption of the Renewable energy Directive(2009). The “guarantee of origin” allows for a circulation and a trading of the “renewable” qualification of wind power electricity. This quality is detached from the physical electrical current, abstracted as an informational asset - a certificate / computer file -, traded and re-bundled with conventional electrical current as a commercial product: the “green electricity” proposed to end users by electricity producers.

Individuation of wind electricity - in Castree’s sense of a separation of this electricity from its supporting environment and context – is at the core of this chain of operations. Yet, individuation here results in a pooling of the electrons and a loss in singularity for the electrons coming out of the same wind farm: their collective origin as the outcome of a singular wind farm is blurred in the process. It is detached from them and redefined as a generic attribute that can be re-bundled with any standard kWh. This displacement is not hidden to the final electricity consumer: commercial contracts blankly assert that by contracting green electricity final users do not actually buy a green electron or a green kWh, they only contribute to the extent of their purchase to the remuneration of renewable electricity producers. Yet, the reach of this displacement is made undiscernible by the displacement itself, for the definition of ‘renewable’ is itself brought into a referential in which it loses its situated origin. Indeed, the quality of being renewable is (re)defined through the decree\(^4\) that sets the “guarantee of origin” as an institutional and trading system. The eligibility to the guarantee as a renewable energy production infrastructure is ruled by the administrative authorisation for electricity production, itself referring to the code of energy for the definition of what is a renewable energy\(^5\). The corresponding definition clearly is essential: the code merely lists the types of energies considered renewable, without any considerations or provision regarding the ways in which these are actually assembled as energy resources. Therefore, while the displacement operated by the guarantee of origin is transparent to the final consumer, but the meaning of this displacement – that is, the extent to which the wind power project that is remunerated through the renewable certificate was actually assembled in a sustainable way or not – is not traceable.

In the end the commodity chain is roughly divided into two parts. A downstream part is made up of ‘provisioning \(\Rightarrow\) distributing \(\Rightarrow\) commercialising’. It is the part whereby the kinetic energy of the wind, once extracted through the turbine as an appropriated uneven electrical energy (alternator), enters a genuine commodification process including both the physical transformation of the energy (transformer, merging with electrical flow) and its abstraction as informational assets (standard kWh; certificate of guarantee) that can be separately traded and re-bundled as a marketable products (“green kWh”).

The upstream part of the commodity chain, made up of ‘depositing \(\Rightarrow\) harnessing \(\Rightarrow\) extracting’, is the one whereby the untamed wind is turned into appropriated uneven electrical energy, to be injected in the grid. On a practical level, it covers the mapping of wind energy deposit on various scales, the development of the wind farm project including its siting, and the extraction /conversion of the kinetic energy of the wind by the turbines. It is thus the part of the chain in which territorial resources such as land, landscape, local collectives are engaged into project development and planning. In France, the structuration of this part of commodity chain has also been supported by public action – e.g. since the end of 1990’s the French energy agency has coordinated the mapping of wind deposit on a regional scale - and the progressive setting up a policy framework for project

\(^3\) This voltage is further increased by a transformer located in the grid system, for the electrical current to reach 200 to 400kW and circulate in high voltage (transportation) lines.

\(^4\) Définition of renewable energy sources: Art. L. 211-2, energy code
authorisation, which included: permitting, impact studies, public inquiries, spatial planning instruments (Wind Power development Zones, WPDZ), and a wind power tax in order to redistribute part of the benefits from wind power to local territories.

The dynamics of the process through which the framing emerged and was evolved has been analysed elsewhere (Nadai, 2007; Nadai et al. 2015; Labussière & Nadai, 2015). It has been described as a “backward planning process”, symptomatic of the difficulty besetting French politics with respect to decentralizing (wind) energy policy and managing the politicization of wind power. The adoption of Feed-in tariffs (2001) in the absence of any planning or permitting framework witnessed of French regulators belief that economic incentives and private business alone could take charge of assembling wind as a renewable energy resource. Instead, a few years of contested wind power development and rising local oppositions nurtured an emerging controversy about the relevance of wind power as a renewable energy technology. In 2005, a rather stormy parliamentary debate on the energy programming law (Pope Law) resulted in the adoption of WPDZ, construction permit (including impact studies and public inquiries) and a redistributive tax. These were aimed at regulating the so-called environmental and landscape ‘impact’ of wind farms and bring their development into spatial planning. While the adoption of WPDZ bounced on ongoing local experiments with the spatial planning of wind power (Nadaï & Labussière, 2014; Nadai & Debourdeau, 2013), it also carried out the political ambivalence under which it was born. Statutorily, the French WPDZ was an energy supply contract that could potentially bridge the up- and the downstream of the wind power commodity: the projects sited in these zones became eligible to feed-in tariffs. Yet, while WPDZ had to be proposed by towns or groups of towns and approved by the departmental prefect (State representative), they were not - as in Germany or Denmark - an urban planning document, which would have forced decision makers to pass through local democracy (e.g. community councils) in order to decide about wind power projects. WPDZ has been contested from its inception: first by wind developers and the renewable energy lobby who saw it as an institutional barrier to renewable energy development; more recently by wind power opponents who have strategically attacked it in courts in order to block wind power development. It was finally cancelled in 2015. This withdrawal occurred in a controversial context, whereby multiple and contradictory attempts at either freeing wind power from political complexities and institutional barriers – e.g. by standardising and streamlining authorisation procedures – or blocking it – i.e. through courts or by bringing it into new authorisation procedures – interacted in a complex way and resulted in its inscription as an environmentally risky facility (ICPE, literally “Classified Installation for Environmental Protection”), subjected as such to codified risk assessment and authorisation procedure.

This outcome could be regarded as symptomatic of a political will to reduce the complexities surrounding wind power development in the upstream part of the commodity chain by addressing them through the formal, procedural and objective appraisal of risk assessment. Public inquiries still remain part of the process. Yet, as standardisation and formal appraisal gain room in the upstream of the chain, they built up a referential by which the quality of being ‘renewable’ comes to be defined in a more objective, stable way and leans to be detached from the process of its emergence.

It is thus interesting to examine into more details this upstream part of the chain, so as to shed light on the multiple fates that the bundling of resources can follow on the local level.
**Fig 3: The commodity chain of French wind power**

<table>
<thead>
<tr>
<th>Chain of commodification</th>
<th>Depositing</th>
<th>Harnessing</th>
<th>Extracting</th>
<th>Provisioning</th>
<th>Distributing</th>
<th>Commercialising</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>turning the untamed wind into a deposit</td>
<td>capturing the untamed wind</td>
<td>extracting the energy from the wind</td>
<td>entering the extracted energy into a provisioning system</td>
<td>transporting the energy to the places where it is to be used</td>
<td>exchanging the energy for money with the final user</td>
</tr>
<tr>
<td>From untamed to wind turbine</td>
<td>Grid connection [upstream local transformer]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From blades to local from electricity meter and market/trading places to distribution grid (upstream meter)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Renewability**

- **Abstraction**
  - untamed wind brought into representation through map m/s + some crit.
- **Individuation**
  - untamed wind framed as laminar wind, partly separable from supporting context
- **Appropriation**
  - untamed wind made ‘renewable’ energy through permit authorisation (incl. impact studies, risk assessment, ICPE)

- **Connexion author.**
- **Feed-in tariffs**
- **Garantee of origin**

<table>
<thead>
<tr>
<th>Collectives at work</th>
<th>Wind power industry, turbine insurance</th>
<th>Wind power developers</th>
<th>Utilities, DSO/TSO, grid manager</th>
<th>Electricity providers, final elec consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local actors</td>
<td>Wind power developers</td>
<td>Local state</td>
<td>French Govt</td>
<td></td>
</tr>
</tbody>
</table>

**Individ. / alienability**

- untamed wind on blades, kinetic energy turned into uneven alternative elect. energy (alternator), privately owned

**Connexion**

- ReN kWh quality detached and circulated as information, (guarantee of origin)

**Displacement**

- ReN quality redefined as generic attribute of kWh, and rebundled into commercial product (‘green kWh’)

**Valuation**

- through trading betw. utilities on market places
2.2. Aveyron, exhausting a collective

Aveyron (South West France) is one of the French departments with the best wind potential. Wind power development started in the Aveyron in 1999. No wind power planning whatsoever was in place at that time. In order to cope with the increasing number of projects submitted for approval, the local administration decided to set up an inter-services platform (in 2000) and to start devising a planning scheme. At that time, the Regional Natural Park of the Grands Causses (RNPGC), a non-state actor, had suggested approaching wind power planning on the scale of the ‘massifs’. The suggestion was that massif entities offered a framing that was more compatible with collective action - local mayors could collaborate in planning wind power - and made it possible to take better into account issues of landscape (far-reaching co-visibilities) and proximity. In 2000, the idea was discarded by the prefecture as being too complicated because massifs overlapped administrative divides. The local administration set aside this territorial approach because of the lack of landscape analysis capable of objectifying these massifs entities.

The outcome was a first wind power planning scheme issued in 2005. The approach translated wind power issues into zoning through several operations such as the definition of landscape ‘types’ based on morphology and heritage values, the mapping of regulatory constraints and the addition of buffer zones so as to compensate for regulatory insufficiencies in the face of the exceptionally far-reaching co-visibilities imposed by industrial wind turbines. This gradual shift from a qualitative landscape issue to a zoning logic (favourable, unfavourable or negative) certainly answered to administrative instructors’ need for rationality and objectivity in the face of the pressure from wind power developers (Nadai & Labussière, 2009). Superimposing the map of the wind speeds and this planning scheme provided the developers with emerging visions of profitability (the best deposit …) and renewability (… with the less administrative ‘constraints’).

Fig 4 : Wind potential and wind power administrative scheme in the Aveyron (April, 2005)
However, the development inside the favourable zones was left unplanned and the pressure for project development was not really regulated. As the local administration was unused to communicate figures about projects under consideration (accepted, under acceptance, refused), word-of-mouth made up for the lack of information. Inhabitants of a hamlet in the Massif of Lévezou started to go door-to-door in order to cross-reference information. Doing so, they joined private concerns into a network covering the Lévezou, in which they quantified more than two hundred wind turbines under consideration for project development. In other words, wind power development was reaching a tipping point and compromising the entire massif of the Lévezou. In order to structure a resistance against wind power, they created a league (‘Levezou in peril’) so as to tie threads (heritage, proximity, landscape) that were kept separate by the administration. Thus the local opposition endowed massif entities with a political existence. At the same time, landscape protection was facing the limits of the first wind power plan. Co-visibilities between the projects sited in these zones and the zones deemed to be protected for wind power visual impact could not be avoided. The rapid technological development of wind energy technology (increase in size, power and economic profitability in wind areas deemed unprofitable a few years ago) soon made landscape choices obsolete. Eventually, this first administrative wind power scheme proved unable to bring wind power projects on tracks for assembling local resources in way that proved sustainable. These projects clearly contain seed of unforeseen environmental and social externalities. “Renewability”, if any, was here defined in a way that was rather procedural – i.e. attached to project / electricity production authorisation and detached from the field.

In 2006, WPDZ had just entered into implementation phase at the national level and provided the local administration with a legitimacy to revise the existing wind power plan. The Aveyron prefect was replaced. The new prefect imposed a temporary moratorium on wind power permits until all WPDZ could be turned into the administration by intercommunalities. With the financial and methodological support of the RNPGC, new wind power basins were designed by coordinating the WPDZ processes on the scale of the massifs, which were thus endowed with a political and relational existence. The process, which is still underway, has highlighted the unexpected potential of highlands (former commons used for grazing during the nineteenth century) at the outermost of the massifs. The situation of these highlands limits the co-visibilities between the wind farms and the villages. Their status makes it easier for communities to share the financial benefits from wind power. While this new way of approaching wind power planning and projects embodied a different – more debated and potentially more durable - way of assembling local resources in the development wind power, it did not live up to its promise. In the years before, private developers had already intensively prospected the countryside. They had made contacts, offers, if not contracted with local mayors and land owners: they had shown promise of significant revenues from wind power developments. Stimulated by a high feed-in tariff, favoured by the neo-liberal start of French wind power policy and aligned with a procedural-definition of ‘renewability’, most of these seeds of projects had been developed in a confidential way, delaying or limiting their becoming public in order to avoid debates and controversies as regards to their territorialisation. The expectations that had been weaved around these (seeds of) projects resulted in small coalitions spread out over the territory. They did not agree with conditioning their future revenues upon a more collective approach and a large scale negotiation. They certainly played a role in the rise of local oppositions to wind power, partly because they fell apart and nurtured animosity and conflicts in the process of recasting the planning of wind power, partly because collective attempts of wind power planning ran into the de facto development of these projects. As local social synergies in villages fell short, people’s capacity to engage in the devising of a territorial project for wind power was in certain cases merely exhausted. As one of our interviewee admitted it, a generation must passed by wind energy to be tamed – i.e. for wind power to break away from passed conflicts.
2.3. Seine-et-Marne, trampling on commons

Seine-et-Marne, an area occupied by industrial agriculture, is situated in the south-eastern Île-de-France region, one hour distant from Paris. The population is both rural and neo-rural, i.e., former urbanites who have left the city in search of a better quality of life. Wind power development is faced with lively opposition (11 projects underway, 7 projects stopped, 10 anti-wind power NGOs in 2010, and 6 MW approved in 2013).

Opposition to wind power has been described by outsiders (i.e., private developers) as rooted in Nimby concerns and neo rural population. Our analysis adopts an insider’s perspective on the construction of local opposition (Nadaï & Labussière, 2014). We follow the development of networks of so-called ‘opponents’ to wind power in the village of Ventville in the Southern part of Seine-et-Marne.

Before wind power, Ventville was famous for its ambiance. Agricultural families used to work as community organisers. Farmers and their families were personally committed to building a public life that could be shared with the other inhabitants. Farmers’ families used to lead local NGO’s and had, through generations of mayors, been in charge of local politics. Being the mayor relied on the everyday art of working with (and for) neighbours, who are also the voters. This collective management of the local life can be regarded as a first ‘common’ shared between the municipality, local institutions, NGO’s and inhabitants. Another ‘common’ rely on a shared agricultural space, called the ‘plain’. The ‘plain’ is a continuous entity of fields. These fields are free of infrastructure (i.e., no high voltage lines, no motorways, only a small road for access). They are easy to plough, crop and, eventually, switch parcels of land to consolidate more continuous and coherent individual parcels. The continued agricultural quality of the ‘plain’ has been maintained for generations of farmers by individual management of each parcel and by their periodic exchange through land consolidation. In both instances, the common good resulted in a wise entanglement of private and collective concerns so as to maintain overtime the agricultural potential of the plain.

In 2003, the arrival of wind power started to rend these social synergies. A project was initiated by two farmers on their own lands, in the ‘plain’. As one of them was the mayor of the village and omitted informing the other inhabitants, a conflict of interest ensued. The first inhabitants to hear of the project, Mr and Mrs Why did not have a pre-defined stand on wind power. They took a one-day trip to “experience how it felt to be in a wind power landscape” (sic) (at Janville, 100 km from Ventville). Later, during a city council meeting, they advised the mayor and two of his assistants to go there and experience for themselves a wind power landscape. The mayor and his assistants did so, but maintained their refusal to open a public debate about the Ventville project. Mr and Mrs Why organised a consultation at their house, where people could come, read documentation about wind power, talk and eventually sign a petition asking for a referendum. Yet the municipality had already submitted a proposal for a wind power development zone (WPDZ) for administrative approval and the mayor did not follow up on the petition. He put forward the democratic legitimacy of his mandate as a basis for deciding on the project. Inhabitants asking for a public debate about the project had no choice but to become engaged in the local opposition to wind power. In the end, growing tensions led to ruptures in long-established social networks and to social violence, such as tags, insults and muggings. The perspective of a wind power project also affected the traditional management of the ‘plain’ because of the uncertainties and constraints generated by the devolution of parcels to fixed infrastructures (i.e., wind turbines, underground cabling). Thus, after several attempts to open the process to public consultation and to allow for a collective appraisal of wind power issues (i.e., sharing the experiencing of a wind power landscape with the city council, organising a home-made consultation, petitioning for a referendum), the dispute moved to electoral ground in 2008. For the first time in the history of Ventville, the mayor faced an opposition list in the

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6 ‘Ventville’ is a pseudonym, chosen by the authors for the purposes of this paper.
local election. He was re-elected and publicly framed his success as the sign of political support to the wind power project.

In this context, the late departmental (Seine-et-marne) wind power planning exacerbated the strategic dimension of local conflicts. The local administration undertook a usual sieve mapping exercise that directed the potential wind power development towards three sectors on the margins of Seine-et-Marne. These sectors included Ventville, where landscape sensitivity to wind power development was supposed to be low. Such a framing increased local tensions, since the first wind power projects to be authorised would turn potential sectors into actual wind power zones for additional developments.

Local opponents networked so as to coordinate areas of vigilance in the south of Seine-et-Marne. A myriad of local NGOs entangled their resources on a new scale and engaged in collective action. Such a meso-territorial level allowed this new community to seize the sectors targeted by the administration, to discuss in a more-than-a-project perspective the groundings of French wind power policy. The challenge was to foster a debate on landscape protection and wind power policy on a scale congruent with landscape issues. As this new web was not limited in space, the politicization of wind power policy had a chance to proceed and progress gradually over the frontiers of the Île-de-France region.

In spite of local and more than local opposition as well as legal proceedings, the project was eventually granted administrative authorisation. Hence, it was official registered as a renewable energy project eligible to feed-in tariffs as any other wind power project.

The case of Ventville underlines how hard it can be for a municipality to endow a wind power project with a collective dimension. At the national level, the French government asserts that wind power is endowed with public interest and considers as renewable any project granted with administrative authorisation. Yet the Ventville case proves that, for many reasons, the public dimension of wind power is not a given. It must be reconstructed on a project-by-project basis. Still in the Ventville case, French institutions proves weak in sustaining this reconstruction: they leave local authorities with a critical role in bringing the wind power on tracks for sustainability and failures to do so nurtures local opposition. In Ventville, where the agricultural and social ‘commons’ have historically been strong, the mayor has in the end been allowed to harness the wind through a narrow coalition with a private developer.

2.4. Narbonnaise, venturing in ontologies

The Regional Natural Park of the Narbonnaise (PNRN) covers the eastern part of the Aude department (Languedoc-Roussillon, south-western France), which stretches along the Mediterranean coast just north of the Pyrenean mountains. Since the adoption of fixed tariffs in France, in 2000, the Aude and especially the windy Narbonnaise have been pioneer sectors in the development of French wind power. By the end of 2007, ten wind farms (110.2 MW, 92 windmills) were installed on the territory of PNRN and various planning documents (at the regional, departmental and PNRN levels) had already attempted to regulate wind power development.

In 2002, the area included some of the allegedly worst examples of wind farm siting in France and the PNRN was faced with an increasing number of wind power projects. It decided to commission a landscape company to devise a planning scheme for wind power; a process which proved quite

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7 Including the fact that France has a low-CO2 electricity mix (dominance of nuclear energy).
innovative (Nadaï & Labussière, 2013). The PNRN wind power charter was adopted by the PNRN steering committee in 2003. This planning process brought together mayors, wind power developers, NGO’s and ministerial field services in a consultation. The aim was to set the boundaries for favourable and non-favourable envelopes for wind power developments, together with specific landscape recommendations (‘re-powering’9, densification, dismantling). The resulting envelopes were thus sectors in which it was felt acceptable to set wind farms. Surprisingly, they mainly targeted small plateaus, such as the Plateau de Haute Garrigue, which overhang villages. The graphic design of these envelops carefully avoided territorial delimitations (such as administrative borders, communal or private land limits) in order for planning to ward off appropriation strategies and be geared towards a multidimensional and relational appraisal of the wind resource. Concretely, this meant providing wind power developers with areas in which project development was thought to be acceptable as well as with recommendations for approaching the siting of wind farms in these areas. Yet, the plan did not prescribe any specific design for the siting of the project. Rather, it enticed developers to go into the field and further explore the likely relations with - or recomposition of - local resources (such as landscape, land, wildlife...) that their project could induce. Unlike much normative planning that produces zonings for the development of a generic technology, the Narbonnaise planning process thus maintained its openness to the multiplicity of situations. The wind power potential was therefore not only a technical one but it also included territorial dimensions. Two processes are illustrative of these dimensions.

The first process pertains to a project sited in an envelope covering the Plateau de Garrigue Haute (Nadaï & Labussière O. 2013). In the 1990s, the Plateau de Garrigue Haute welcomed the first industrial wind farm in France. In 2010, this project was entering its repowering phase, again the first instance of such in France. Repowering provided an occasion for reconsidering the siting of the project and for articulating it on various scales and dimensions of the landscape. On the large scale, the landscape company in charge of the wind power charter emphasized the need to account for landscape relations and align the turbines with a major historical axis in the landscape, an old Roman road parallel to the seashore (i.e., Via Domitia). The plateau also emerged during the devising of the charter in the form of a piece of common land that was traditionally used by several farmers and villages for sheep grazing (‘biens sectionnaires’). The status and location of these common lands allowed the surrounding municipalities to depart from administrative frontiers, join and take part in siting turbines, which could be sited as one and coherent wind farm on the plateau. On the small scale, the existing wind turbines provided birdwatchers with an opportunity to depart from categories of protected species in order to follow and observe migrating birds strategies in relation to the presence of wind turbines (Nadai and Labussière, 2010). Birdwatchers devised an innovative method called ‘micro-siting’ that allowed them to translate bird strategies into statistical and spatial representations congruent with planning categories, so as to negotiate the siting of turbines with the wind power developer.

The second process (Nadaï A. & Labussière O. 2010) relates to a neighbouring small plateau (Villesèque-des-Corbières), former grazing land that had been invaded by a garrigue cover. Boar hunters and protectors of raptors had joined together and set a up a European Life project10 in order to re-introduce sheep grazing and reopen the habitat for small game (such as rabbits and hares, which are prey for boars and raptors). As the local branch of the French Bird protection NGO –the “Ligue de Protection des Oiseaux” (LPO) - survey showed, the repowering on the Plateau de Haute Garrigue was likely to deprive raptors of part of their hunting territory. It was thus decided to use part of wind power benefits for environmental compensation (habitat creation for small game in a nearby area). Concretely, this meant an additional financial support for a shepherd in order to bring

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9 ‘Re-powering’ consists in dismantling an existing wind farm and in increasing its capacity by installing new, bigger and more powerful wind turbines. It is currently the way that countries such as Germany and Denmark increase their wind power capacity.

10 http://aude.lpo.fr/life-consavicor/accueil.htm
it to economically viable size. Therefore, wind power development not only contributed to ecological management and the revival of a traditional agricultural activity, but also was interwoven into traditional structures of landscape management.

In both of these processes, we clearly see that capturing an untamed wind calls for a reappraisal of ontologies (e.g. birds), of their attributes (e.g. protected) and of relations to the resource (e.g. the ability of birds to play with the wind). Repopulating the wind can be regarded as a strategy, which avoids reducing the wind to its physicality and appropriating it in an un-renewable way.

In this case, the renewability of emerging wind power projects - and potential - is constructed through specific rules of reciprocity between birds, birdwatchers, game hunters and the private developers. Indeed, LPO’s made its collaboration on this wind power project conditional upon a follow up and monitoring of birds death on the wind farms over the years.

A few years after this innovative experiment, the Plateau de Haute Garrigue repowering project still was under instruction for administrative permitting. The local LPO deciding to stop its collaboration with other wind power developers and projects in the Narbonnaise area because of two strong a pressure for wind power development in this area. Therefore, while this experience had proved very innovative, it could not be followed up on a bigger scale because of the lack of regulation on wind power development in the Narbonnaise.

3. The contestable sustainability of wind power

3.1. What commodification does to wind power

The three cases that we just presented illustrate the difficulties faced in attempting to assemble wind power in a sustainable way at the local level, as wind power policy gears its construction towards private profit and market making. Seen from a local perspective, the difficulties faced in the development of wind power projects are often perceived – and thematised (Geraint et al, 2009) - as resulting from planning shortcomings in the face of wind power developers pressure to get new projects on the ground.

The commodity chain analysis sheds a renewed and more incisive light about these difficulties and the role of French institutions. The wind power commodity chain is divided into two parts by the feed-in tariffs and the guarantee of origin, with an associated rupture in the way renewability is constructed. In the upstream part of the chain, the bundling of resources raises issues. While the term ‘renewable’ is never explicitly challenged, the sustainability of wind energy is at stake and under construction. In the downstream part of the chain, renewability is detached it from its conditions of production and made tradable. This allows for a large scale trading and commercial re-bundling of renewability into ‘green’ electricity, which results in an upwards economic incentive on project development. This does more than just accelerating the pace of wind power development. It brings this development on tracks that favour market-based rather than territorial assemblages, and gives priority to the type of project development that most efficiently maximises private profit.

In this game, project development acquires a performative dimension, because returns on experience from projects development and exploitation – their material dimension - end up grounding certain relational assemblages as more realistic and performant than others. They better serve policy objective. The actors in charge of these projects, their way of practising are endowed with economic and institutional powers, not the least because of the money transfer sustained by economic instruments such as feed-in tariffs. These actors are thus set in a position to give policy formulation an inflexion, which ends up privileging what counts in their way of developing projects.

As the materiality of wind power is both shaped and shaping in this process, it can be said to be relational. Asserting that wind energy is renewable *per se* because of its physicality (flow energy) - as
does the French energy code - is not right or wrong. It is performative: it gears project construction towards a minimal way of assembling the wind as an energy resource, a way that does not exhaust the physical flow.

This construction of wind power around a physical definition of the renewable resource only holds to the extent that projects assembled on these bases do not raise too much opposition. In France, it is proving to be a fragile and ill-functioning construction. The case studies that we have presented in the above illustrate tensions and [failed] attempts at proceeding differently. On a national level, the issue is also recurrent, as witnessed by the progressive judicialisation of both wind power projects and WPDZ. Interestingly, with the recent withdrawing of French WPDZ, wind power developers have shown increased interest in devising charters of good practices for project development, yet up to now without agreeing on a charter. Differences and tensions prove that the issue of which resources to account for and how to bundle them in order to make wind a sustainable energy is left unsolved.

3.2. Sustainability and the relational materiality of wind power

The wind resource, its materiality and the relational interdependencies it contributes to, sometimes go along this project, sometimes resist to it. This results in certain side effects, which may generate tensions (externalities). We point here at some of these external effects in relation with the materiality of the resource.

Non storable energy and the unique electricity market

The fact that electricity still cannot be stored has contributed, at least in the EU, to a neoliberal account by which grid interconnection and a unique electricity market would sustain the energy transition because it would allow offsetting ReN electricity intermittency through European-wide market pooling. French policy which constructs the ReN kWh as a standard tradable kWh (plus a ReN tradable quality, a guarantee of origin) goes along this neoliberal project of unique electricity market. It abstracts the renewable quality (cf. supra) and transforms the ReN kWh into a standard kWh that can be traded as any other kWh on the electricity market. So ‘provisioning’, in the case of wind energy is obtained by market-pooling and market-based regulation.

Intermittence as a resistance of the resource

However, untamed wind, the unpredictability of wind, still resists commodification. As we have shown it, wind energy is circulated along the commodity chain in various forms: intermittent ReN electricity is one of them. As intermittency had not been accounted for in the first years of Ren development in France and in the EU, it has soon raised issues by interfering with the existing practices of valuation on the electricity grid and market, provoking negative electricity prices. This first happened in Spain, then in the EU, and it became critical in Denmark as the share of wind electricity has risen. This was dealt with in various ways in order to have wind power developers integrate the cost induced by their electricity production. In this case, the resource resists commodification to the extent that its temporal materiality cannot be fully tamed through storing: the attempt of making it into a stock-like resource, so as to regulate the electrical commodity price, fails in the face of lack of sociotechnical agencement that could take charge of a flow- to stock-conversion on a relevant economic scale.

WPDZ as a bridging device

The extracting of electrical energy operated by the rotor in the wind turbines is the step at which energy is actually appropriated by wind power developers: the administrative production and connexion authorisations are the key devices allowing for the appropriation of the energy of the wind, because they register the property of the turbines and allocate the right to feed-in tariff to the corresponding owner. As these authorisations are delivered upon purely technical grounds, the bundling of other (non-electrical) resources is not accounted for and there would be no reason for ReN to be developed in a sustainable way.
Interestingly, the French WPDZ was supposed to operate such a bridging. It was aimed at conditioning the eligibility of wind power projects to feed-in tariff upon the inclusion of these projects into a potentially multi-dimensional spatial planning (landscape, environment …). Yet, marred by the ambiguity of the political process that overarched on their adoption (Nadai, 2007), the devising of WPDZ left room for interpretation in the way in which they should be implemented. Early on, WPDZ were contested by wind power developers and professional unions, who casted them as a barrier to wind power development. Later on, they were strategically contested in the courts by opponents to wind power in order to stop the development of this energy. WPDZ ended being legally cancelled in 2013, under the political lobbying of a coalition gathering members of the French Green party and the wind power developers union.

In the end, there is currently no longer any articulation between the upstream part of the commodity chain – depositing and harnessing – over which territorial and social resources are engaged in the development of wind power projects, and its downstream part that reconstructs renewability as a stable attribute of standard electricity commodity.

These few examples illustrate how unaccounted resources or effects constantly challenge the assemblage of wind energy. In this process, the materiality of the wind resource can resist to or go along with the attempts at commodifying it as energy. In doing so, the materiality of wind and electricity takes part in the development of web of relations that may or may not contribute in accounting for all the other resources that are engaged in the construction of wind as energy resource. The sustainability of wind energy depends on the extent to which this relational potential is made representable and/or debatable, so as to be brought into politics for arbitrage. Entities are recomposed in this process, as do birds in the Narbonnaise process. Birds are not just qualified as skilled. Qualifying them so, bring them into a process that is performative: it allows for a siting of the windfarm that makes it possible for migrating birds to competently fly over/under or through the windfarm. Birds and wind power are both recomposed in the process: they become compatible beings. All this means that the process of assemblage of a sociotechnical system has an ontological reach and it is this process which makes an energy sustainable or not.

**Conclusion**

Renewable energies are not necessarily sustainable. Sustainability depends on the way in which resources are assembled as energy resources.

Taking the case of French wind power, we have looked at the way through which it is being assembled as an energy resource and an energy commodity. The analysis has allowed us to point at the key role of policy instruments - such as production authorisation, grid connection authorisation, feed-in tariff, guarantees of origin ... - in articulating the construction of renewable energy to a legal, often physical definition of renewability.

The reduction of renewability to such an essential (physical) attribute of flow-energies disregards the way in which other, often shared, resources are engaged in the construction of renewable energies. While this eases market-making as it detaches the qualification of these energies from their territorially embedded and sometimes conflicting construction and origin.

The commodity chain analysis has allowed to explore these interactions and cast a new, more political, perspective on the relation between the upstream (depositing, siting, grid connection) and downstream (distributing, trading, marketing) parts of the chain. It has allowed us to point at various ways in which wind, as a material resource resists or go along commodification.

This way of constructing renewability generates intense market pressure (upwards) onto non-wind resources. As shown by different case studies, it makes it extremely difficult for local actors to bring the development of wind farms on sustainable tracks. Side effects ensue, which only part of them are
accounted for by planning institutions or market design. Renewable energies, if wrongly assembled, can exhaust their potential for development. Sustainability is a possibility for rather than an attribute of renewable energies.

French wind power just is one singular instance of renewable energy. Human geography shall contribute further in exploring the words of these energies by reopening the reductive « renewable » qualifications of other resources such as solar, biomass or hydro energy.

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