



## Original research article

## Challenging obduracy: How local communities transform the energy system

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## ABSTRACT

The transformation from the current energy system to a decentralized renewable energy system requires the transformation of communities into energy neutral or even energy producing communities. Increasingly, citizens become 'prosumers' and pool their resources to start a local energy initiative. In this paper we present an in-depth study of networks that recently developed, which challenge the established way of centralized decision-making on energy resources.

Many local communities are eager to promote sustainable energy production, to use local financial resources for the local community and to employ democratic governance of energy production and supply. Furthermore, we study how these co-operations are linked to local, regional and national networks for community energy.

We use both Actor-Network Theory (ANT) and Social Movement Theory (SMT) to investigate the initiatives, as this allows a dynamic analysis of collective strategies.

We discuss the obduracy of the energy system and how this system is challenged by new connections between communities and global networks and by new types of energy providers that are rooted in social networks. Furthermore, we draw attention to the way community energy networks provide a social innovation while realizing a decentralized and decarbonized energy system.

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## 1. Introduction

The transition to a sustainable energy system entails the mobilisation of local communities and local production of renewable energy. This is a technical challenge, but also, and in particular, requires new social, economic, financial, cultural and political arrangements [1]. Many cities, towns and villages have already put together ambitious visions about how to become 'energy neutral', 'zero-emission' or 'low carbon'. In several European countries, such as the Netherlands, Germany and the UK, we observe a rapidly growing number of local citizens groups that aim to stimulate local energy production capacity on an individual as well as cooperative basis [2,3]. On top of this ambition, many citizens try to organize the governance of energy production on a more democratic basis; they contend that the future energy system should not only be sustainable, but also decentralized and democratically governed. Citizens

want to have democratic control over energy investment decisions, in order to ensure that these investments are made into renewable energy production. According to some observers, this signals a trend contrary to developments in the past few decades, where governance of energy production has gone in the opposite direction, from the hands of local and regional governing bodies to international companies [4]. This combination of developments raises questions about how local initiatives are able to connect vis-à-vis the countervailing forces of established parties and arrangements.

In a European perspective the Netherlands is very much in the rear-guard with only 4% of electricity production coming from renewable sources.<sup>1</sup> Domestic heating is primarily based on the use of natural gas from the Groningen field, in the North of the Netherlands. However, this field is likely to be empty within about two decades and the extraction of gas increasingly leads to

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earthquakes in the region, necessitating the quest for alternatives. Hence, especially the Dutch energy system will have to face a substantial transformation.

In this paper we investigate the recent attempts of local Dutch communities to challenge the present energy system and to find new ways of organising and governing energy production. Recent developments in the Netherlands show signs that local initiatives are forming new regional clusters, which could contribute to the scaling up of local attempts and thus to mainstreaming renewable energy. In this process they have to overcome economical, technological, political and physical constraints or 'obduracies', and these are what we want to explore in this paper.

We build on recent claims that local energy cooperatives provide an alternative model for the governance of energy resources [5,6]. We argue that the described new regional networks are an understudied, yet crucial element to organize the production and distribution of energy in a democratic and sustainable way, and as such contribute to the wider process of grassroots innovation, as defined by Hargreaves et al., [5]. Our theoretical contribution is the combination of Social Movement Theory (SMT) and Actor Network Theory (ANT) in the analysis of recent attempts to decentralize and decarbonize the energy system. In this way, we also contribute to the existing literature on local energy initiatives as well as to the critical reflections regarding the conventional energy system.

The remainder of this paper is organized as follows. First, we discuss the studies of local energy initiatives (Section 2). The theoretical Section 3 will introduce the concepts from ANT and SMT and present the theoretical backbone of our approach. In Section 4 we introduce our research design and methodology, and describe our case, especially the background, formation and goals of the newly formed regional energy co-operations. Furthermore, we investigate the linkages of local initiatives to existing regional and national networks, including environmental movement organisations and village support organisations. In Section 5, we analyse the new intermediary energy networks, and their relation to local and global networks. In Section 6 we discuss the findings of our case study and relate them to the literature.

## 2. Studies of energy communities

Increasingly the varying roles of citizens regarding energy consumption and production have caught the attention of researchers [3,7–12,67]. Basically, these roles range from passive consumers to active creators of new energy systems. Here, we give a short overview of preceding research into this spectrum of roles.

The literature shows that citizens are often framed according to their acceptance of or resistance to renewable energy [3,13,14]. It especially investigates whether citizens are willing to take part in government programmes for energy efficiency, to install new equipment in or on their houses, or to choose renewable energy when their provider offers this option [15]. Stern argues that citizens can influence government policies through acceptance, acquiescence, or resistance of changes in the energy system. Furthermore, he calls for more research into households as energy producers [16]. Resistance to sustainable energy, i.e. in the case of the siting of windmills is another widely studied phenomenon, where concepts such as procedural justice [11,15] and NIMBY are being discussed [17].

Some studies contend that in the current energy system the possible roles of consumer-citizens are extended [2]. Already in 2007, Walker and Cass presented ten roles, where the role of the traditional passive consumer is only one of the options engaged citizens can choose. Active consumers can select their own provider and choose their preferred energy source, such as fossil or renewable. With the installation of PV-panels they become co-producers or

'prosumers' of energy, as well as user-innovators of energy technology [18]. In general, prosumers appear to share a pro-environment attitude [19,20]. The German Energiewende increasingly shows the enormous social changes brought about by a large number of individual and small PV installations, in a relatively short period of time [21]. Furthermore, small biomass installations, heat pumps and solar thermal installations are appropriate technologies for the individual prosumer who wants to become more independent from centralized energy supply. Not surprisingly, the existing power companies are reacting on this development in several ways; in order to influence policies according to their interests, as argued by Kungl [22,23] and Hirschmüller et al., [24]. Kungl's analysis of the actions of four leading energy companies in Germany in the first years of the Energiewende shows that these incumbents engage in activities to limit the effects of the EEC to their own advantage. Hirschmüller et al. show that the 'big four' spend ample resources to lobby for their interests, and conclude that lobbying fosters the status quo. In addition, Geels [25] points to the resistance to change of the incumbent fossil fuel industries.

Another new role for citizens is to set up or become a participant of a community energy initiative. Such bottom-up activities show that citizens have started to take control of the production and distribution of energy. Araujo points to the relevance of researching bottom-up change in the area of (energy) policy and governance, so as to expand on studies after market-based and regulatory approaches [26]. Seyfang, Walker and others have researched community energy for the UK [1–28]. In Germany more than 700 cooperative companies were registered in 2012 [29]. These cooperatives are embedded in communities, and are active traders in renewable electricity. Sagebiel et al., [30], who carried out an online Choice Experiment in Germany, report that transparency, share of renewable energy and (to a lesser extent) democratic control are important aspects for consumers, who on the whole exhibit a considerable Willingness-to-Pay for renewable energy. Since 2010 a wave of energy initiatives has emerged in the Netherlands, following examples in Germany and the UK. In 2014, 500 of such initiatives have been counted in the Netherlands, according to an inventory by the provincial 'Federations for Nature and Environment'.<sup>2</sup> These initiatives are actively engaged in promoting decentralized sustainable production [7,12,31]. It is the view of Arentsen [7] that, although these initiatives form a 'seedbed of innovations', they are fated to a niche existence. Comparative case studies have been performed by Oteman et. al., and Bauwens et. al, who draw attention to the constraining or enabling influence of institutional arrangements in for the success of community energy initiatives.<sup>10</sup> [65] North investigates climate activism in the UK [32], analysing demonstrations as well as grassroots activities to highlight the social conflicts inherent to such forms of activism. What transpires from this literature is the abundance of local initiatives that organize and explore new forms of sustainable energy provision at the local level. A key question in this regard seems to be whether such local initiatives will (and should) be able to scale and contribute to a wider transition towards an energy efficient society.

To support each other, local initiatives increasingly unite in networks on varying geographical scales. For example, in Germany there are several countrywide networks on community energy, such as "100% Nachhaltige Energie Regionen" [21,33]. Regional networks and middle actors in the energy system in the UK are discussed by Parag et al. and Parag & Janda, while Moss reports on the role of intermediaries in Germany [34–36]. Parag et al. [34] investigate how local initiatives support each other in various ways

<sup>2</sup> [www.hieropgewekt.nl](http://www.hieropgewekt.nl).

in the region of Oxfordshire; [34] they identified a broad range of supportive relationships between organisations, both formally and informally connected to each other. Parag and Janda further describe the important role of middle actors for socio-technical change, with three case studies in the UK [36]. Hargreaves et al. discuss the role of intermediaries in the support and development of community energy initiatives [5]. Furthermore, they argue that these local initiatives are producing 'grassroots innovations', which they define as innovations 'that challenge and often attempt to replace existing and unsustainable sociotechnical systems' (p. 868). Grassroots innovations, thus, provide a research field that could be further developed. In the literature, the communities' own attempts to realize scale and combine their resources in order to influence the wider sociotechnical system have not received much attention.

We are especially interested in the clustering of local initiatives, the creation of regional energy networks and especially in the role of the middle actors and intermediaries. In this article we examine the situation in the Netherlands, where the creation of regional networks develops at a fast pace; in the past two years many new regional networks have been set up and existing national networks have been merging. These networks not only connect local initiatives with each other but also act as an interface with the more traditional energy system. Given the diversity of networks that support community initiatives, we are particularly interested in the goals, organisation structure and activities of network organisations in the Netherlands. We compare if and how these network organisations act as intermediaries with and for local energy initiatives.

Our principal question is how the various roles of citizens as mentioned above are connected in networks and how networks challenge the existing energy system. Do these networks attempt to provide an alternative and thus try to alter the present energy system? How do these networks contribute to the process of grassroots innovation as defined by Hargreaves [5]? Beyond the local energy literature, several studies take Actor Network Theory as a starting point, such as Walker, Hunter, Devine-Wright, Evans, & Fay [2,8,37–41]. Actor-network theory allows to follow the moves of actors and posits a flat ontology as explained by Jørgensen [42], a perspective that differs from the popular multi-level perspective that is often used in the field of energy transitions. The role of technology in these socio-technical assemblages is part of an ANT approach, as it gives due attention to the non-human actors in a network.

The novelty of our study is to combine Social Movement Theory (SMT) with Actor Network Theory (ANT) to allow a rich description of the formation of regional and local networks, including the role of technology and of collective action. As such, this study deviates from but also complements similar studies, like those of Seyfang et al [43], Hargreaves et al., [5], Magnani & Osti [66] and Parag et al [36]. We will develop our theoretical approach in the next section.

### 3. Theoretical approaches: social movement theory and actor network theory

To allow for the dynamic analysis of collective strategies we combine the theoretical perspectives of SMT and ANT. The latter is particularly suited to describe interlinked networks consisting of human actors as well as institutions, buildings, energy technologies and infrastructures, thus highlighting obduracy and change as grounded in socio-technical networks and assemblages [44]. With SMT, on the other hand, we are able to include collective action and social conflict over the governance of energy resources in our analysis. In this section we first introduce relevant ANT-concepts, then reflect on the benefits of complementing ANT with SMT, and

subsequently explain important SMT-concepts relating to the energy movement.

An important concept when attempting to change an existing system is obduracy, or resistance to change. In general, technical objects and human actors mutually shape each other as they interact, or in the words of Michel Callon: *'the stability and form of artifacts should be seen as a function of the interaction of heterogeneous elements as these are shaped and assimilated into a network.'* [45]. In the literature we find several studies using ANT in the analysis of changes in the built environment. Latour and Yaneva [46] focus on buildings as actants in a network. Aibar & Bijker [47] look at cities as 'enormous socio-technical artefacts', while Hommels [48,49] and Kirkman [50] draw our attention to the causes of obduracy of buildings. These studies have shown that the built environment and the energy system are socially and technically intertwined; a large part of energy consumption takes place in the home, and the energy infrastructure is part and parcel of the layout of villages, towns and cities. Furthermore, decentralized production of renewable energy is also related to households and communities. With an ANT perspective, the obduracy of the energy system can be investigated by following network actors, aiming to understand their activities in the large socio-technical artefact that makes up the energy system at different levels of scale, as intertwined with the built environment.

A criticism regarding ANT is that it is primarily suited for micro studies, producing 'lots of little stories' [51], forgetting patterns and declining to search for explanation [52]. However, this seems to be a consequence of empirical operationalization, with many ANT studies meticulously following details at the micro level, rather than a consequence of Actor Network Theory itself [53]. In our view, ANT is also productive to describe larger networks, linking 'local' and 'global' networks. We have elaborated upon this point in Van der Schoor & Scholtens [12], where we use ANT, as discussed by Law and Callon [54], to show that local energy initiatives are situated along two dimensions: *Attachments to outside networks* and *Commitment of members*. Findings suggest that a high level of commitment and a broad range of attachments help initiatives to reach their goals.

ANT theory does not take a normative position, but follows actors in the creation of networks that interlink normativities with the socio-technical assemblages in which they are constituted and to which they give rise. As such, it is a highly suitable theory to analyse how normative projects contribute to alter existing socio-technical arrangements, give rise to new arrangements and are spelled out in the process, without taking a normative position itself. The energy transition is a normative project; actors express clear goals and opinions about the desired future governance of energy resources. They want a better energy system than the present fossil fuel based one, with all its related ills such as climate change and air pollution. Moreover, they face considerable social conflicts when they struggle to establish their vision of sustainable energy provision in the context of an already existing wider infrastructure with its associated vested interests. Social Movement Theory (SMT) sheds light on how such social conflicts play out in the fight for control about dominant patterns of actions in societal domains, and as such can be helpful in complementing ANT in our analysis.

Following main SMT theorists like Touraine and Melucci, we argue that local energy initiatives are social movements. Indeed, Touraine maintained that the *study of social action* rather than the *study of society* should be the main subject for sociology; therefore the concept of social movement should in his view have central importance. This concept acts as a *"bridge between the observation of new technologies and the ideas of new forms of political life"*. He continues to define a social movement as a special type of social conflict, which presupposes a clear definition of competing actors and of the resources they are fighting for or negotiating to take

control of. Furthermore, he refers to conflicts around “the social control of main cultural patterns, (.) through which our relationships with the environment are normatively organized.” [55] (p. 213)

To reveal the complex nature of new social conflicts, Touraine analysed the actions against nuclear energy, i.e., against “decision makers who have the power to shape national life for a longer period of time in a ‘technocratic’ way. This action tries to foster a grass-roots democracy.” [55] p. 217. This resembles recent work on grassroots innovation, where these innovations are conceptualized and analysed as “bottom-up civil society-led solutions for sustainability” [56] (p.883). Melucci argues that ‘Conflicts are carried forward by temporary actors who bring to light the crucial dilemmas of a society. These (.) processes generate both new forms of power and new forms of opposition.’ [55] p. 219. Drawing on Touraine and Melucci, we argue that local energy initiatives can be understood as such temporary actors that reveal a fundamental dilemma of our society: the normative organisation of the production and appropriation of energy resources. SMT positions conflicts about such a normative organisation as the kernel for a wider transition towards new normative and cultural patterns. That is, we contend that local energy initiatives, and their activities, represent a social conflict about the production and appropriation of energy resources, with the potential to eventually foster new forms of organisation and governance of sustainable energy production. Ultimately, this conflict represents a struggle about how modern societies should provide energy in a more sustainable way.

Regarding network dynamics Melucci emphasises that a social movement is a ‘field of social relationships’ where a collective identity is structured. In these fields, individuals are linked together, forming ‘solidarity networks’. [55] p. 224 The networks that are formed in the community energy movement can be fruitfully analysed as an emergent social movement and thus a conflict about normative orientations towards energy provision. At the same time, these local movements are essentially technology projects, as our subsequent analysis will demonstrate. For this reason, we will apply methods from ANT to follow the variety of human and non-human actors in the formation of new energy networks, as well as the materialities and normativities associated with them. We thus propose to use SMT in combination with ANT to better understand the dynamics of the community energy movement as a socio-technical movement as extension to earlier notions of social movements. More specifically, we will trace the emerging heterogeneous network around a normative project that challenges the existing energy system. Hence, with the help of SMT and ANT, it is possible to position the emergence of energy co-operatives as a new phase in the history of the energy movement, highlighting the socio-material processes that produce obduracy and change.

#### 4. Case description and methodology

In the Netherlands more than 500 local initiatives<sup>3</sup> seek to reshape the energy system in the face of constraints embedded in technical, cultural, economic and political traditions. The goals of local energy initiatives are to accelerate sustainable energy production, to foster self-governing communities, to stimulate local entrepreneurship, to enhance local social cohesion and employment, and to reinvest profits of energy sales to the local community [57]. In many cases, it boils down to the fact that they want to ‘fight the power’. Furthermore, many initiatives have formulated visions about the transformation of their village, town or neighbourhood to a low carbon community. The majority of local initiatives are organised on a democratic basis, with cooperatives as the preferred

organisation model. Activities organized by local initiatives include cooperative projects to buy PV-panels, organisation of information markets on renewable energy, and stimulating homeowners to insulate their property.

We detect a tendency among the local initiatives to cluster into regional networks as part of the development of the local energy movement, without diminishing the local autonomy of local energy initiatives. The goals, activities and development of three regional networks in the North of the Netherlands are the subject of this study.

##### 4.1. Methods

For this paper we studied a cluster of three networks in the North of the Netherlands. These three networks organized themselves along the lines (boundaries) of provinces. Together they founded their own co-operative energy provider.

In our view case study methodology [58] is an appropriate method to investigate an emergent phenomenon such as innovative energy networks. A case study is ‘an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a “real-life” context’ (Simons 2009, cited by Thomas [59] p. 21). Following Yin [60], we used our case study to search for conceptual patterns and categories.

In our study [58], we investigated four cases of regional networks that have been formed in the Netherlands since 2012. In particular, we investigate the networks Us Kooperaasje, GrEK and Drentse KEI, and the cooperative energy provider NLD Energie. We have undertaken qualitative interviews with initiators and board members of these four organisations in four interviews, which each lasted 1.5 h. To gather insights in the relations between local en regional networks we interviewed initiators/board members of two local cooperatives in the province of Groningen and Drenthe. One of these cooperatives has been active for three years and is actively involved in the regional network. The other cooperative has recently been set up and can be regarded as a newcomer in the community energy movement. In this manner we seek to include varying perspectives in our case study, as is appropriate in case study research [58]. All interviews were transcribed and analysed with NVivo, following an open coding strategy in the tradition of grounded theory. Quotations are derived from four of the six available interviews; interviewees are indicated with C1, C2, C3 or C4.

Furthermore, as a background to our analysis we draw on interviews with initiators of twelve local cooperatives and observations of public information meetings, undertaken in the course of a related research project, reported on in Van der Schoor and Scholtens [12]. We revisited this material in a secondary analysis to inform our insights about the local initiatives that were part of this research.

Further information was gathered by visiting websites, Facebook pages, and documents produced by the organisations in our study, as well as blogs and policy documents regarding the Dutch Energy Covenant (Appendix A). These materials were analysed using the same procedures with NVivo.

##### 4.2. Development of a new energy network

In the Netherlands it is possible to buy green electricity from all energy providers. To stimulate consumption of green electricity, many local energy initiatives are active as reseller for an existing sustainable energy provider. The members of the initiative become a client of the chosen provider. In return the local initiative gets a yearly remuneration for each client. A reseller’s arrangement is a contract between a local initiative and an energy provider, which formalizes the rights and duties of both parties.

<sup>3</sup> [www.hieropgewekt.nl](http://www.hieropgewekt.nl) (accessed July 7th 2015).



Until 2014 it was also possible (although not formally allowed) to sell energy through a so-called 'white label construction', which meant that a local cooperative could sell energy under its own name, using the energy supply license of an energy provider. At the end of 2012 one of these commercial green providers, the Dutch branch of Trianel, went bankrupt. Furthermore, the Dutch Authority on Consumers and Markets (ACM) no longer allowed the white label construction. This caused a considerable stir in the world of local energy cooperatives, as the model of providing green energy as well as getting a return for their local cooperative was under threat.

"So our plans to deliver energy to our local initiatives through such an energy provider, these (plans) fell apart." (Interview C1)

Local cooperatives in the Netherlands either had to find another provider, or apply for an independent supply license. Different regions in the Netherlands chose their own paths. Here we will concern ourselves with developments in the North only. This is because this part of the country from a geographical perspective (esp. population density) is much more comparable with the average 'landscape' in Europe than the much denser populated other regions.

Coincidentally, initiatives in the northern provinces were already well under way to unite in regional cooperatives: Drentse KEI (in Drenthe), Us Kooperaasje (in Friesland) and Groninger Energie Koepel (GrEK, in Groningen). They quickly realized that creating your own provider could have benefits.

"Obviously, this has a number of benefits, being in charge of the organisation yourself, but also from a financial perspective. Profits won't leak away. So this was actually even better." (Interview C1)

Thus, the bankruptcy of the existing provider, together with a change in regulation concerning the white label construction, triggered the decision to 'start their own company'.

"So when Trianel went bankrupt and the opportunity of starting our own company presented itself". (Interview C1)

The regional networks together founded NLD Energy as a cooperative energy provider. According to our respondents, this was 'a hell of a job' for a network that at that time was still in the making and relied primarily on volunteers. NLD got its license on 1 April 2014, started work on July 1st 2014 and presently employs four people. In order to create a resilient organisation, NLD has to grow to at least 5000 clients.

NLD is a profit-for-purpose firm, meaning that all profits will be returned to the local cooperatives. Local cooperatives agree to a reseller's contract with NLD, comparable to the usual contracts with traditional energy suppliers. A reseller gets €75, —a year for every client, which represents saved marketing costs. Furthermore, resellers get a percentage of the profits of NLD. The yearly income generated in this way can become rather substantial; for example, the Ameland Energy Cooperation, with a thousand clients, earns €75.000 a year. Furthermore, any profits made by NLD will be distributed among local cooperatives.

Under Dutch law<sup>4</sup> NLD has to accept every consumer that chooses to become a client of NLD. If applicable, this client can indicate to which nearby cooperative the remuneration has to be paid.

The structure as a whole is as follows: local cooperatives are members of the three regional cooperatives, who in turn are the

owners of NLD. Cooperative governance is democratic, as members have to approve decisions in regular meetings.

This structure is seen as unique for the Netherlands. NLD is a consumers network, uniting citizens who want to use their consumers' power to stimulate renewable energy. Furthermore, NLD limits itself to the three northern provinces.

"We are focused on Friesland, Groningen and Drenthe, that's it. This is very consciously done, in order to keep the span of control limited, so that we can be the decent organisation we want to be." (Interview C2)

Regarding future visions, NLD aims to buy and sell electricity produced in the region:

"Of course we try to purchase in the North. You can imagine that every village hall, which has enough room for an array of solar panels, can become a supplier of solar energy. We want to buy and sell locally. Ameland has a solar park that has enough capacity to supply the energy to all our clients on the island, so that would be brilliant, that we purchase their energy and sell it immediately to the people from Ameland themselves." (Interview C4)

Furthermore, NLD would like to experiment with cooperative network organisations, with a view to optimize energy exchange on the local level. For the moment, initiators are convinced that the new network "has the right formula to keep finance and energy local, to close the energy loop and to close the financial loop on a local level" (interview C2). In the next section we will further discuss the goals of the new energy network.

#### 4.3. Goals of the energy network

Throughout the interviews, it shows that three main goals of the new energy network emerge: realisation of sustainable goals, keeping financial means within the region and democratic governance of energy resources.

1. *Realisation of local sustainable goals.* The profits of energy sales become available for local cooperatives to invest in local sustainability projects, such as sustainable energy production.

"Goals of the local cooperation have a central place, such as an orchard, a solar park, a windmill, or a new installation for the swimming pool. With the NLD, with this concept, we can make money and this will trigger an acceleration. . ." (Interview C1)

2. *Keeping financial resources within the region.* The view of initiators is that money spent on energy is leaking away, especially since the formerly publicly owned utilities were 'liberalized' and sold off to multinational companies (in the Netherlands to RWE and Vattenfall). Thus profits are not used to generate economic development in the region.

"You're talking millions, that we throw away together." (Interview C2)

"... it is our intention not to let money be diverted to shareholders or other people elsewhere, the whole point is to keep money fully in the Northern region." (Interview C4)

3. *Democratic governance of energy resources.* Initiators want to exert greater influence on the operations of their energy provider, in order to safeguard sustainability goals. On the local level, investment decisions are up to the energy co-operatives themselves.

"Because the real argument, to supply your own energy and to decide yourself how your energy is produced, how it is purchased, where it is purchased, (.) furthermore, keeping profits in the region, preventing that they leak away to foreign countries,

<sup>4</sup> Electriciteitswet (Electricity law) 1998 Art. 95<sup>b</sup>.

but instead are invested in your own neighbourhood, where you have a say in things.” (interview C2)

These goals are linked in multiple ways, for example local energy production can at the same time stimulate local economic development. Furthermore, democracy is a goal in itself as well as a means to safeguard that profits are invested in local sustainable projects.

#### 4.4. Regional networks in Friesland, Drenthe and Groningen

In this subsection we briefly describe the energy networks in the Northern provinces, which have their own organisation structure, statutory description, members, website, and board and see themselves as quite distinct from one each other.

“It was a very clever move to create three umbrella organisations, because you have three provinces, with different DNA, different political priorities, (.) who each want to make sure that money will stay within their own provincial boundaries.” (Interview C2)

The goal of the regional network is to support local initiatives with practical advice, to enlarge the network and to share knowledge. Furthermore, the network also has to safeguard that the money is invested in a sustainable way

##### 4.4.1. Lets' get started: Us Kooperaasje

The development of the regional cooperation in the province of Fryslân started with a few people who had been thinking for a longer time about ways to stimulate local energy initiatives, and who thought ‘just lets' get started’. They first founded a ‘foundation for the foundation of ...’, which is a usual approach to get something off the ground.

“Then there were a few people who said, well, we just have to get started. So they thought about an organisation structure, created a board, found a few people who were willing to invest some time and effort.” (Interview C1)

The next step was to apply for provincial funds for legal procedures, a statutory description and the development of a website. In March 2013 ‘Us Kooperaasje’, meaning ‘Our Cooperation’ in Frisian, was founded. The team consists of eight to ten people, including a half time employee and a board with five members. It is described as very active and close-knit. Interviewees recognize the need to expand their activities, which in their eyes makes paid employees a necessity. Therefore they are actively looking for ways to generate more funds.

There is no physical office; the board has different locations where they can meet. They are guest of several friendly organisations, who provide a temporary place to have meetings. But this is considered of low importance.

“The office is negligible, we always have a place where we can meet, in different locations. Even our postal address changes regularly, I've already forgotten which is the last one. (.) Actually, almost everything is done digitally. But you need a place to sit dry, to plug in a computer and to have meetings.” (Interview C1)

Some board members are at the same time active in local initiatives, while others have a background in the energy sector. The chairperson is mayor of Dongeradeel and as such brings in a large network.

The co-op is founded by and works for the local initiatives, who can apply as formal member of Us Kooperaasje if they have properly set up their local organisation, have a statutory description and a plan of work.

The local cooperatives as mentioned before work with a reseller's arrangement. Yearly they receive €75 per client from

NLD. It is entirely up to them how they spend this money, although there should be a link with sustainability and energy projects.

“This money they can invest in the manner the local cooperation wishes, they decide with their own local members, we are not responsible for that. Naturally, the idea is to use the money to stimulate local sustainability projects.” (interview C1)

Presently, thirty local cooperatives have joined Us Kooperaasje. The organisation is largely dependent on highly motivated board members and volunteers, however, the board aims to attract funding in order to employ more professionals.

##### 4.4.2. Wait and see: Drentse KEI

In the province of Drenthe the regional network is called Drentse KEI, where KEI is the abbreviation of Koepel Energie Initiatieven, meaning umbrella organisation of energy initiatives. In Drenthe a lot of boulders from the ice age are found, such a boulder is called a ‘kei’ in Dutch, hence the name.

Drentse KEI has a board with five members; it has no office and no employees. All work is done voluntarily. As yet, Drentse KEI has fewer members than its Frisian counterpart. One of the reasons for this lies in the mentality of the people from Drenthe.

“In Drenthe we have the problem that people from Drenthe are inclined to wait and see for a very long time. So we move very slowly.” (Interview C2)

It is difficult to get the message across, interviewees tell us. Why would clients choose for NLD? The arguments include climate change as well as price and service with traditional providers. But it proves difficult to get the ‘real argument’ as they call it, across. This argument concerns the governance of energy resources, as discussed above in Section 3.1.2.

In order to get resellers arrangement with NLD, a local cooperative has to become a member of the Drentse KEI, for €250. In return they receive a certificate.

It is stressed repeatedly that the regional network is democratically organized. The local cooperatives also should organize themselves on a democratic basis.

“It cannot be a foundation, because a foundation isn't democratically organized. So they need to be a union or a cooperative” (Interview C2)

The function of the regional network is to support local initiatives. They organize instruction meetings, help the initiatives with legal procedures and give fiscal advice.

The local cooperatives have to decide themselves how the money will be spent, in Drenthe interviewees observe that this is difficult on a scale where several villages belong to the same cooperative, for example when a cooperative is organized on the scale of a municipality.

“It is too large, here is someone from Luttingerveld, hier is someone from Een, here is someone from South- well whatever, and they don't even know what these villages look like, so they can't decide when Luttingerveld says ‘We need something for our village hall, maybe the cooperation can pay for that?’ - if that is a reasonable request.” (Interview C2)

Drentse KEI has seven local cooperatives that have become a full member. The organisation consists of volunteers, who are also active in local cooperatives.

##### 4.4.3. We do it ourselves: Groninger Energie Koepel

In the province of Groningen the number of local energy initiatives is rising rapidly. From only five members in 2012 now there are seven full members and another eight are in

preparation stage. The name simply refers to Groningen as province, but in the communication the Groninger language is regularly used, to provide a strong link to the cultural identity in Groningen. The slogan ‘we doun’t zulf’ means ‘we do it ourselves’ in the local language.

GrEK was started somewhat later than the other two regional networks, because the existing strong cooperation Grunneger Power long tried to fulfil a coordination role themselves, which slowed down the development of a regional network.

The Groninger Energie Koepel has a vision where the province is able to provide for its own energy needs.

“Our vision is that in the province of Groningen local village organisations and energy cooperations work towards an independent fossil free supply of energy.” (Interview C3)

In order to reach this goal local initiatives have to be supported.

“To achieve that, we try to stimulate, encourage and link local initiatives to get started.” (Interview C3)

The organisation of GrEK is rather low profile; so far the only employee is a full time volunteer, who is assisted by students doing their internship. Board members also fulfil many tasks, such as representing the organisation in meetings. Board members are based in different regions and bring in their own networks. Furthermore, the majority of board members are active in one of the local cooperatives.

“Increasingly, you find out that everyone has his own network in the region, so it is natural that board members are active in their own region, not only as a member of the board but also in the local cooperation.” (Interview C3)

“Furthermore, you notice that every region has its own characteristics and its own mentality.” (Interview C3)

In GrEK several initiatives are organized as a working group under the umbrella of the village organisation. This is seen as an important asset, because the village organisation has a broad range of members, whereas a dedicated energy cooperative runs the risk of being stigmatized as a green organisation, which can lead to an isolated or marginal existence.

“Whereas—as I gather from Frisian experiences—there are villages with small organisations only consisting of sustainably oriented people, this can lead to an isolated existence.” (Interview C3)

Furthermore, the cooperative has to remain true to a broad definition of sustainability, where economic or social aspects are as important as environmental benefits.

“Not only look at green issues, but also take economical benefits and social aspects on board.” (Interview C3)

The issue of geographical scale is mentioned as very important, comparable to the situation in Drenthe. Cooperatives that are organized on the level of a municipality run the risk of being too far from people’s needs, or even to encounter age-old conflicts between villages.

“Scale is in my view a decisive factor, if you choose a scale that is too large, it is difficult for people to identify with the club.” (Interview C3)

Groninger Energie Koepel (GrEK) has now expanded to ten local cooperatives, while another twelve initiatives are in the process of developing their organisation to full membership. The organisation has a small office in Groningen, together with NLD (see Section 4.2) and Grunneger Power, one of the largest local cooperatives in the region.

#### 4.5. Organizing collective action

Volunteers set up the local cooperatives as well as the regional network organisations; these volunteers are engaged citizens who have a strong normative motivation to invest their time and effort in the pursuit of sustainable energy. Although some network organisations do employ a paid coordinator for a limited amount of hours, the majority of the work is done voluntarily. This poses specific challenges, regarding investment of working hours, knowledge, or the outreach to a wider audience of citizens. On the other hand, the opportunity to earn money that can be invested in the own community is an important incentive to join the network. Below we briefly discuss these challenges. In the literature [61] concerning volunteering our attention is drawn to the time and effort needed to run local organisations. It is indeed a rather busy existence for the active members of the community energy movement. Organisation size is very limited, only the Frisian cooperation has a temporary part-time employee. In the interviews the ‘constant stream of meetings’ is mentioned. One type of meeting is the local information meeting. Volunteers mention they visit a village information meeting twice or three times a week. Furthermore, there are meetings organised for information sharing, instruction or otherwise. Interviewees are sometimes worried about the workload for volunteers.

“People who for next to nothing work days, weekends and even nights to get things done.” (Interview C1)

Although there are views that a modern organisation would be preferable, in practice board members invest a lot of time and effort. “You just have to do it together.”

Furthermore, in order to be effective in pursuing the transition to sustainable energy, local cooperatives need to be knowledgeable about subjects such as energy technology, political strategies and financial housekeeping. It is stressed repeatedly that a lot of knowledge is available in the local cooperation’s and the network as a whole.

“You have to realize that a lot of knowledge is available, also locally. If you think that knowledge is only in the heads of a few specialists, you are terribly mistaken.” (Interview C4)

Another aspect is that many local initiators have a background in energy technology or have previously worked for traditional energy providers. This knowledge is now dedicated to challenge the traditional energy system.

A novel incentive for local cooperatives to join this network is added by the financial rewards that can be generated, which have to be invested in local community projects.

“Village cooperations are almost always dependent on small subsidies and contributions, however, we provide a model to make money, to create a substantial stream of money to the local community” (Interview C3)

In this way, initiatives have the opportunity to implement their vision on local sustainable development. However, there have been voiced concerns about the outreach of local cooperatives to a larger part of the community. This suggests that marketing strategy and communication tools could be improved to attract more clients.

“What I want to know is, whom do we not reach? Why are people so difficult to convince, can we improve our arguments, our story? Because we want something, we believe in it, but we don’t succeed in selling it properly.” (Interview C2)

The regional networks and local cooperatives rely almost exclusively on volunteers, although especially the regional networks apply for funds in order to expand their organisation. External

knowledge is sought by working together with local schools and universities. Furthermore, networks seek to work with municipalities, environmental organisations and other pre-existing networks. This will be developed further in the next subsection.

#### 4.6. Interlinkages with pre-existing networks

The provincial bottom-up networks we just introduced in our case study have been created only recently; they entered a landscape already populated with other organisations, which also aim to support local energy cooperatives. For the outside observer an increasingly complicated pattern of networks is displayed. In this section we primarily want to position the newly created regional networks in relation to the pre-existing regional top-down networks of NGOs and provincial authorities and discuss the linkages between these types of networks. Furthermore, we briefly look at the role that relevant national energy networks play in the energy transition.

In the provinces existing support networks are organized along the lines of provinces and topic areas. In all Dutch provinces there is an environmental network organisation, uniting and supporting local environmental groups. These organisations usually have a central Dutch office with employees working on specific environmental subjects, such as transport, energy, nature conservation, waste management or spatial planning. Furthermore, they attract funds for specific projects, such as setting up a service point for local cooperatives. The environmental umbrella organisations are united on a national scale in the Stichting Natuur en Milieu.

On the other hand there are provincial organisations that are dedicated to support organisations in (small) villages. This can range from financial advice for the exploitation of the village hall to exchange of ideas on local care, or community gardens. As many local cooperatives started out as an informal working group of a village organisation, the provincial village support organisations received many calls for support on the setup and running of an energy initiative. These are funded by the provinces and employ a handful of employees. At the national level the 'Network Sustainable Villages' was founded, which supplies villages with an interactive website as well as a platform for meetings. This network was funded by the province of Friesland, and managed from the Frisian village support organisation.

Therefore, the landscape of intermediary energy organisations is roughly organized in two pillars, one stemming from environmental concerns and the other from village perspectives. On a provincial scale these support organisations often work together, to increase the total level of support. On the other hand, the organisations compete to attract funds for their projects.

An overview of the existing networks in the Northern Netherlands is presented in Table 1.

Looking at this provincial network landscape we notice that the existing networks undertook projects such as *Lokale Energie Voorwaarts* and the *Energiewerkplaats*. They also organized numerous meetings, which served as an important platform for local cooperatives to meet and share knowledge and experience. The relation of the new networks with the existing ones is geared at cooperation and profiting of reciprocal strengths. However, conflicts could arise around the provision of money to existing organisations, leaving the new networks without funds.

On a personal level we observe structural as well as incidental links between the networks. The cooperative structure of the provincial networks and the NLD means that representatives of local cooperatives can be a member of the board of the network as well as the NLD. Furthermore, some citizens from the Northern region are active in one of the national networks. For example, one of our interviewees is a member of the local cooperative in the municipality of Noordenvelde; he is also a member of the board of

Drentse KEI, the provincial network in Drenthe; for Drentse KEI he is on the board of the NLD; and on top of that he is board member of E-decentraal, one of the national networks. This combination of volunteer positions links networks from local to national.

National networks have been set up at the beginning of the surge of local cooperatives, such as E-decentraal. The role of these networks is primarily geared at lobbying and organizing national conferences for information sharing.

#### 4.7. Provincial and municipal environment

In accordance with SMT we observe that initiatives 'confront political authority on specific grounds' (Melucci); they regularly try to influence local decision-making, but emphasise that they do not take part in traditional party-politics. The relation of local cooperatives with the municipal and provincial government can be characterised by a certain degree of unease. For example, in Drenthe none of the municipalities is a client of NLD, and neither are the provinces, although they expressed their sympathy and helped its foundation with a loan. Furthermore, only the municipality of Midden-Drenthe has a clear approach to local energy initiatives and has an active local energy policy, supported by instruments such as courses for homeowners, Financial support for local projects or initiatives is lacking, while the sustainable energy fund in Drenthe rules out small initiatives, due of the financial threshold of €50,000 per project. In the province of Friesland municipalities and the province have drafted lofty visions on sustainable energy, but according to our respondents they lack capacity and instruments to put these visions into practice. The province of Groningen has installed a fund to support local initiatives as well as a special instrument for large(r) projects.

On the municipal level, authorities organize information meetings for local cooperatives and increasingly include local energy production in policy documents.

It seems a difficult task for local and provincial authorities to find appropriate ways to financially support local energy production. They have to steer between EU regulation regarding government aid, making funds available for small ventures, high costs for operating support schemes, and loss of influence over provincial funds. However, an in-depth analysis of provincial energy funds is outside the scope of this article and would merit a separate investigation.

## 5. Discussion

### 5.1. Sociotechnical transitions

Regional energy networks in the Northern provinces of the Netherlands have been set up by local cooperatives. Subsequently, these regional networks founded the cooperative energy provider NLD-Energie. Local cooperatives become a reseller for NLD, earning money for every client they bring in. NLD is (so far) the only energy provider in the Netherlands that is founded and governed by local citizens' initiatives. The regional energy network is a grassroots innovation, as it challenges and aims to replace an existing socio-technical structure. In short, the new energy network is democratic, decentralized and sustainable and aims to contribute to regional economic development, while the traditional logic is centralized, fossil fuel based, without influence of citizens and dominated by multinational companies.

In this section we further discuss the results of our case study according to the theoretical interests of ANT and SMT (Section 3), in particular the issues of democratic control and network processes.

In Table 2, we present two dimensions regarding the grassroots innovation of the energy system in the Netherlands: a dimension of scale (ranging from individual to national) and an



**Table 1**  
Overview of support networks in three northern provinces of the Netherlands.

OVERVIEW of support networks Northern Netherlands				
Regional network	Region/ province	Grassroots (bottom-up organisation)	Environmental organisation	Village support organisation
GReK (GroningerEnergieKoepel)	Groningen	x		
Drentse Kei	Drenthe	x		
Us Kooperaasje	Friesland	x		
NLD	Groningen, Friesland, Drenthe	x		
Milieufederatie Groningen	Groningen		x	
Milieufederatie Drenthe	Drenthe		x	
Milieufederatie Fryslân	Friesland		x	
Doarpswurk	Friesland			x
Vereniging Groninger Dorpen	Groningen			x
BOKD	Drenthe			x
Energiewerkplaats	Friesland			x

**Table 2**  
Grassroots innovation of energy system.

	Prosumers	Communities	Regional networks	National networks
Incremental reform within existing energy policies	Reduce energy for heating and appliances	Local cooperatives for supplying green energy	Regional networks for support of local cooperatives	Projects for support of local cooperatives
	Produce own electricity, grid connected	Local PV-groups	Cooperative provider set up by regional networks	Organisation with local cooperatives as members
	Buy green energy	New social enterprises for supply and production of energy		
Radical reform of energy governance	Energy neutral, passive houses	Autarchy, low carbon, or energy neutral communities	Extend cooperative services to all households in the area	
	Produce own, off grid	Local grids	Experiments with cooperative network management	

incremental-radical dimension (ranging from incremental solutions to systemic changes), reflecting the degree to which the proposed alternative aims to replace existing sociotechnical arrangements. North's analysis for the UK [62] also includes ordering climate groups according to their radicalism.

The regional networks act as an important instrument in the upscaling of local energy supply and production. Attempts to change the logic of decision making and governance of energy resources is visible in the different activities listed under 'radical reform'. While concrete options are available for individuals, energy neutral visions are not yet realized in the region under study. On the level of regional networks ideas are developed for a regionally governed energy system, including supply to all citizens as well as cooperative management of technical energy networks.

Consistent with SMT, the new energy network challenges the existing governance of resources, and provides an alternative logic, which is democratic, decentralized and sustainable. Technologies are not neutral, but materializations of normative visions of sustainability and democracy. Furthermore, financial resources earned by the new energy network are cooperatively controlled and invested in sustainable projects. Replacement with another logic will expand even further with cooperative management of electricity networks, which however is not yet possible in the Netherlands.

## 5.2. Control of energy policies on a community level

The trigger for the decision to create a new cooperative energy provider was the bankruptcy of their former provider, Trianel, and the closedown of the 'white label construction' by the market authority (ACM). This development prompted the Northern groups to evaluate the model of delivering sustainable energy by means of a traditional energy provider.

To sell renewable energy under a white label or by means of a reseller's arrangement does have drawbacks, according to the local cooperatives. Firstly, energy companies have shareholders, which means that profits 'leak away' to shareholders, often located outside the region. Investments and employment therefore do not fully benefit the region. Therefore it is strongly felt that the region does not benefit economically from consumer expenditures in energy, which is seen as an important missed chance in this economically weak region [63]. Secondly, local cooperatives have no say in investment or other strategies of a traditional provider; only shareholders have a (limited) influence on decision-making. However, the initiators want to make sure the energy is produced sustainably and preferably in the region. For these reasons, the networks in the three northern Dutch provinces chose to apply for a supply license and thereby founded an independent energy provider. In this respect, NLD provides an alternative to traditional energy providers, trying to re-organize technologies for energy supply and consumption in a way consistent with a democratic way of governing the energy system. However, NLD also has to comply with existing rules and regulations regarding energy providers, highlighting it as a social movement that from the outset has to cope with materialized versions of traditional energy provision.

Democratic governance of energy resources according to our respondents helps to attain three main goals:

- Promoting and implementing sustainable energy production units on both an individual and a community scale;
- Keeping financial resources in the community with a view to invest profits in local sustainable goals;
- Enhancing democratic influence of citizens on their energy provider.

Democracy at the level of the provider should safeguard sustainability as well as the distribution of profits to the local cooperatives, which, in turn, should be democratically organized to involve local members or clients in their decision-making about the investment of these profits in local projects. In the terms of Melucci [55] we interpret this as a signal that the local energy movement is posing political demands for the democratic control of energy policies, as well as finding ways to realize their vision within the present regulatory framework. This aligns with the reasoning of Touraine and Melucci, when they claim that the basis of a social movement is a conflict over (the governance of) resources [55,64].

The new energy initiatives aim to use other logics to structure local energy supply. This is consistent with the concept of 'grass-roots innovation', which aims to replace existing socio-technical structures. Material manifestations of the new structure are facilities for local sustainable energy production, such as solar panels, solar parks, small windmills, and biomass facilities. Furthermore, innovations such as energy storage, e-mobility or smart grids are experimented with by local cooperatives.

### 5.3. Local communities and regional networks

From a social movement perspective [55,64] we would expect personal ties between local initiatives, regional networks and national organisations. This is indeed apparent in the combination of roles that individuals take up, as the majority of board members of these organisations usually are also active in one of the local member organisations. However, only one of the respondents combines his local and regional activities with a function as board member in a national energy network. Other respondents report they are not spending much thought or time on national organisations, as they are far too busy with running their own initiative.

Based on the model of Van der Schoor & Scholtens [12], we expect that initiatives with both strong attachments to outside networks and highly committed members achieve the most local results. In this respect we first of all notice the very high commitment of the actors in the networks. Not only is almost all work done voluntarily, involving a huge amount of time and effort, interviewees also hold outspoken views on the best way to organise the future energy system.

Secondly, regional networks and NLD are a means to increase the number of attachments to outside networks.

Thirdly, although national networks are known by the local cooperatives, and some members are themselves active in national networks, this is not considered a high priority. According to interviewees, day-to-day work on the local level is far more important for the organisation.

Fourth, referring to local network attachments the following observation is relevant. One of the goals often expressed by local cooperatives is to enhance social cohesion in their community [57]. However, the reverse is also true, in the sense that small cohesive communities have a greater chance of maintaining a successful local cooperative. If the scale of a cooperative is too large—for example if it is organized on the level of a complete municipality with several villages—it runs the risk of experiencing difficulties with involving their members, and problems can arise with decisions on the budget. Furthermore, information meetings should preferably be held in the locality or neighbourhood itself, because otherwise only the 'converted' will turn up. Even meetings only one village (two kilometres) away attract less people, and from a smaller segment of the population. It seems that commitment is immediately lessened when activities take place elsewhere. Finding the optimal scale for the local cooperative appears to be of paramount importance for the success and continuity of the organisation.

Fifth issue is the question of informal and formal organisation structures. On the basis of the interviews we notice

that informal working groups, connected to a general village organisation, can reach a broad constituency, whereas specialized energy cooperatives sometimes can become isolated, missing out on this broader audience. Although such a working group has an informal appearance, in fact formal ties are derived from the membership of the provincial network organisation.

## 7. Conclusion

We conclude our paper with a discussion of challenges to the energy system by new regional networks and cooperative energy providers. In effect, the existing system is challenged on sustainability, primarily the transition from fossil to renewable fuels; on its contribution to regional investments and employment; and on democratic procedures, especially the incorporation of preferences of its clients. Obviously, the new energy movement maintains that the existing energy system in the Netherlands is severely failing on these three accounts.

In the social movement for local energy transitions, we observe a wide diversity of interacting and overlapping networks linking together individual prosumers, regional providers and national lobbyists in our case study. The cooperative model is apparent throughout; the local cooperatives have to be democratically organized; together they constitute a regional cooperation in their respective provinces. The three regional cooperatives in the provinces in the north of the Netherlands in turn are the founders and only members of the cooperative energy provider (i.e. the regional energy network). We conclude that the people in the energy movement organize themselves according to an ideological vision concerning sustainability, regional economy and democracy, thereby challenging the present governance of the energy system. Therefore, the network structure as described in this paper is regarded as a grassroots innovation.

The described network structure has three goals:

1. Sustainability: profits will be invested in sustainable projects on the local level.
2. Regional economy: profits are kept in the region, while stimulating innovation.
3. Democracy: governance of energy and related financial resources is organised on a democratic basis.

As such, our analysis complements different strands of the literature. Relating this innovation to Sagebiel [30], who points to the willingness-to-pay for sustainable energy from cooperatives, we find that there is considerable scope for these networks to be successful. Relating to Parag [34], Hargreaves [1] and Seyfang [43], we observe a dynamic field of networks that are in constant development. In the described networks there is a strong and widely held common vision, which is an important factor for success, as argued in van der Schoor & Scholtens [12]. The energy cooperatives require considerable time and effort of its volunteers. Local and provincial networks have absolute priority in their daily business. Therefore, few people can afford to spend much time on national networks, although informants do find these useful for lobbying and information sharing.

*Community energy, what should it mean?* asks Gordon Walker in his article [37]. On the basis of our study, we conclude that among other things it means a close relationship with regional culture and a specific mentality. The networks all refer to the mentality, or way of thinking, in their region as important for the best approach. In their communication all networks use regional language to connect to people living in the region. In Friesland

this is quite common, as Frisian is the second official language in the Netherlands, but also in Groningen and Drenthe local expressions are used. This conveys regional pride, where people first see themselves as Frisians, for example, and only secondly as Dutch. Another manifestation of the desire to align with the region is that these networks are organized along provincial boundaries in the first place. This is not self-evident, because in Dutch national political circles the relevance of provinces and their boundaries are often challenged. Furthermore, the networks hold the explicit view that the energy provider NLD should be limited to the three northern provinces, to remain close to local networks and people.

It may seem quite a jump from local grassroots initiatives to an economically viable energy provider, which makes it all the more important that NLD employs people who have background knowledge of and experience in the traditional energy sector. In combination with the democratic structure and formal contracts this should provide a basis for continuity. The network structure is rooted in the region by means of the local member cooperatives. Via their respective provincial networks these cooperatives control the activities and policies of NLD.

The network has been put in place and, hence, the next challenge of the local cooperatives is to attract enough members and clients to the new energy provider to sustain the business model. Many local cooperatives have enough on their hands, struggling to involving enough people to continue, and fully dependent on volunteers. The outreach of local cooperatives to the wider population in the community is repeatedly voiced as a challenge.

The new networks still have to find their niche, to further develop relations with the existing networks and institutions. On the one hand, the new networks want to develop good working relations 'for the common good'. On the other hand, there are opinions that government money is now channelled to traditional organisations, which in their view not always take the best approach or have the necessary knowledge to service the local cooperatives in the best possible way.

One of the limitations of our paper is that it lacks an assessment of the potential economic impact on the regional economy of an energy system as envisaged by our interviewees. Such research would be of great value for further assessment of the progress of local energy transitions and may be undertaken after their projects have taken off.

Democratic governance of the energy system could act as an important lever in the quest for a more sustainable energy society. Socio-economic as well as technological consequences of such development in comparison with traditional fossil fuel production merit further investigation.

The combination of Actor-Network Theory and Social Movement Theory in this paper brings to light the day-to-day activities of the network actors, and helps interpret these networks as a challenge to the logic of decision-making in the energy system. Furthermore, actor network theory focuses our attention to the intricate overlapping networks in the new energy movement, while social movement theory permits an explicitly goal-oriented analysis. Combining these two theoretical perspectives thus highlights not only the 'what and how', but also the 'why' of this phenomenon. We conclude with the observation that our case studies show that even a small network of highly motivated citizens is able to challenge the present logic of governance of energy resources, providing a grassroots innovation of the energy system.

## Appendix A. Websites regional and local energy cooperatives (accessed June 24 2015)

*Websites regional and local energy cooperatives (accessed June 24 2015)*

[www.grek.nl](http://www.grek.nl).  
[www.drentsekei.org](http://www.drentsekei.org).  
[www.nldenergie.org](http://www.nldenergie.org).  
[www.uskooperaasje.nl](http://www.uskooperaasje.nl).  
[www.duurzameenergie.org](http://www.duurzameenergie.org).  
[www.facebook.com/pekela.duurzaam](https://www.facebook.com/pekela.duurzaam).  
[www.hieropgewekt.nl](http://www.hieropgewekt.nl).  
[www.edecentraal.nl](http://www.edecentraal.nl).

### - Other documents included in analysis

- Letter to the parliament concerning the implementation of the Energy Covenant (in Dutch)
- Notysje Energij Kooperaasje (in Frisian).
- blogs.
- newspaper articles 2010–2014 (assessed via LexisNexis).

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