



Three is a crowd? Exploring the potential of crowdfunding for renewable energy in the Netherlands



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ABSTRACT

There is a huge gap between demand and supply of finance for energy transitions, and the financial and economic crisis have had a negative impact in the already meagre funds for transforming the energy system towards renewable sources. In this paper we explore whether crowdfunding for renewable energy, as a novel sociotechnical practice developed in a niche, has the potential to break through and transform both the energy and the financial regimes, utilising the Multi-Level Perspective theory. We empirically investigate crowdfunding platforms linked to renewable electricity projects in the Netherlands. The main conclusion is that the volume of crowdfunding today is low, but the dynamic of these projects holds potential. There is limited indication of learning processes until now, as well as limited support from regime actors, pointing at a low level of niche stabilization and break-through potential, which may however be related to the early stage of development of crowdfunding in the Netherlands. On the other hand, the heterogeneity of crowdfunders is very promising. Platforms dedicated to renewable electricity exclusively, and with an investment based business model seem to be the most successful. We show how governmental market regulation and support mechanisms are shaping crowdfunding as a business model, and discuss the implications for other countries.

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1. Introduction

Sustainability transitions, large scale changes in socio-technical systems for the provision of needs such as energy, food and healthcare, have been advocated the last decades as solutions to environmental and socio-political challenges: energy security, resource scarcity, and climate change (Geels and Schot, 2010). The nature of these transitions is such that large investments would be necessary, even if the level of this transition is confined within one nation state (Jacobsson and Jacobsson, 2012). Since the financial crisis of 2009, both governmental funding as well as bank investments decreased, with a resulting gap between supply and demand of financial resources for renewable energy projects in different national settings (Creutzig et al., 2014; Eleftheriadis and Anagnostopoulou, 2015; Geels, 2013; Luthra et al., 2015; Suzuki, 2015; Yildiz, 2014). At the same time, especially in the energy

market, new business models have emerged to fill in this gap, even though at smaller scales. Business models can be defined as ‘the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities’ (Zott and Amit, 2010) (p. 219), and they are a means to market new technologies like renewables (Chesbrough, 2002; Zott et al., 2011).

Many of these models are based on the direct participation of the energy user in energy production: for instance citizens owning shares in solar PV installations (Huijben and Verbong, 2013). More recently, some of these models are based on crowdfunding, defined as “the collective effort by people who network and pool their money together, usually via the internet, in order to invest in and support efforts initiated by other people or organizations” (Ordanini et al., 2011). Crowdfunding is not new – it builds upon previous models, such as cooperatives, or microfinancing; but the recent use of social media has given a tremendous boost to crowdfunding and enabled new forms (Harrison, 2013). Different forms of crowdfunding exist, including donation, lending and reward systems where investors are rewarded with a token.

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Our starting point in this paper is that crowdfunding as a business model for renewable energy projects might not only financially shape energy transitions, by, for instance, tapping into financial resources of users, at a time of scarce bank loans after the global financial crisis (Tomczak and Brem, 2013), but can also increase societal support for renewable energy as users and citizens become more actively engaged in energy systems. This can potentially translate in political support. As such, crowdfunding can shape positive feedback loops between technological, market, social and political dimensions of energy system transformation.

Indeed, the growth rates of crowdfunding have been impressive (Tomczak and Brem, 2013). Even though systematic figures are scarce, there is an estimated \$2,7 billion raised worldwide, in different types of platforms, with \$1,6 billion in North America, \$945 million in Europe, and 110 million in the rest of the world.¹ In 2014, €12,5 billion was crowdfunded worldwide, with €7,3 billion in North America, €2,5 billion in Europe, and €2,6 billion in Asia.²

The Netherlands offers an interesting case of crowdfunding in many respects. The Netherlands ranks 4th in the world in number of CF platforms (2012 data).³ Structural conditions are very favourable: internet access is among the highest in the world, and there is a very successful online payment system called iDEAL.⁴ Indicatively, €63 million euros were crowdfunded in the Netherlands in 2014 in more than 2000 projects.⁵ This represents 3.75 euro per resident, somewhat lower than the United Kingdom, but above average in continental Europe (less than 1 euro per citizen).⁶

The Netherlands is also an interesting case from the point of view of renewable energy transition. While it has been among the pioneer countries in the discourse around sustainability transitions (Markard et al., 2012), the actual practice in terms of renewable energy is lagging behind other countries, as a result of low levels of governmental support and turbulent public policies (Huijben and Verbong, 2013; Verbong et al., 2008). In 2013, the share of renewables to the total use of electricity was 10%, including hydro, wind, solar, biomass and biogas.⁷ Recently, the number of projects where citizens joined forces and, through different forms of collective action, together enabled PV and wind implementation has seen substantial growth rates (Doci et al., 2015; Huijben and Verbong, 2013). This suggests that in the Netherlands there is great need for new business models for renewable energy such as crowdfunding, and the country has favourable facilitating conditions in place.

Our paper explores crowdfunding for renewable energy projects in the Netherlands as a novel socio-technical practice developing in a niche, with the aim to evaluate its potential to upscale and transform the energy and financial regimes. Our main research question therefore is:

“To what extent can we see evidence of crowdfunding for renewable energy projects having stabilised as a niche and having the potential to break through the energy and financial regimes?”

2. Literature review

2.1. Novel socio-technical practices

We position our paper in the sustainability transitions literature, and in particular in relation to one of the field's key frameworks – the Multi-Level Perspective (MLP). The multi-level perspective explains long-term transformations as interactions between socio-technical regimes, broader landscape developments and innovative niches (Geels, 2002). Socio-technical regimes are the incumbent path-dependent structures such as institutions, networks and infrastructures that stabilise the provision of human needs. A radical transformation of these regimes is needed for achieving sustainable development. Such a sustainability transition comes about as the result of broader 'landscape' trends and events that provide a dynamic context for regimes, and experimentation by heterogeneous actor networks developing socio-technical alternatives in protective spaces called niches (Schot and Geels, 2008).

In this paper we view crowdfunding for renewable energy as a novel socio-technical practice developed in a niche, with the potential to upscale and transform both the energy regime, as well as the financial regime. We also draw upon recent advances in literature on business models, to understand whether crowdfunding for renewable energy as a new business model, that is, a socio-technical practice developed in a niche has the potential to upscale. Such a link between MLP and business model literature has been attempted before; for instance the suggestion that new business models are being developed in niches (Boons et al., 2013; Huijben and Verbong, 2013; Jolly et al., 2012).

With the recent increasing interest in the literature about business models, there have been several taxonomies of business models, most of which rest in slightly different definitions of the term. A comprehensive and systematic study identified eight different archetypes of sustainable business models, depending on the main type of business model innovation (technological, social and organisational) (Bocken et al., 2014). Interestingly, crowdfunding is mentioned there as an example of a business model based on organisational innovation, which can help develop and scale up sustainability solutions. Even though this typology is useful for studying broader changes in businesses, such as corporate social responsibility, and for emphasising the innovation aspect in different archetypes, it is too generic for categorising business models for renewable energy specifically, which our paper explores. Therefore we turn to, and utilise an existing categorisation, based on PV market developments, and show how we can categorise other literature in this taxonomy. We realise that there are country-specific models, but these three broader categories hold true for these country-related specificities.

In a study on PV market developments in the Netherlands three main types of business models were identified: a. *customer owned*, b. *third party* and c. *community shares* (Huijben and Verbong, 2013). *Customer-owned* or *self-investment* refers to a model where individual households or companies invest in renewable energy technology (e.g. solar panel) and own it individually. This model has also been identified as a *microgeneration plug and play model* in the UK context (Sauter and Watson, 2007), with a relatively small role for the company providing the system to the customer in a one stop

¹ infoDev (2013), *Crowdfunding's potential for the Developing World*. Finance and Private Sector Development Department. Washington DC: World bank, p. 19. Available at: http://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf.

² <http://www.douwenkoren.nl/en/crowdfunding-worldwide-12-5-billion-euro-in-2015/>.

³ Some statistics suggest it is the third <http://www.statista.com/statistics/251573/number-of-crowdfunding-platforms-worldwide-by-country/while> the World bank report suggests it is fourth http://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf.

⁴ It is not a coincidence that the largest worldwide platform, Kickstarter opened in the Netherlands, in the spring 2014, in its first outside-the-USA attempt.

⁵ <http://www.douwenkoren.nl/crowdfunding-in-nederland-2014-de-cijfers/>.

⁶ <http://www.douwenkoren.nl/crowdfunding-in-europa-25-miljard-euro-in-2014/>.

⁷ According to official statistics, at <http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=70789ENG>.

shop. A similar *turnkey* business model was also identified for residential and commercial application of PV business models in Europe and the US (Schoettl and Lehmann-Ortega, 2011). In the Netherlands, a lot of customer owned PV systems were bought in local or national collective buying initiatives where households or farmers joined forces in buying PV systems for individual use, claiming a discount with suppliers and making it very easy for customers to join the initiative (Huijben and Verbong, 2013).

The third party model is one in which the PV system is financed by a different party than the one using the electricity produced, removing thus the high initial investment barrier and attracting new customer segments such as those with tight budgets (Drury et al., 2012). Huijben and Verbong (2013) found different types of investors in the Netherlands including banks, companies, housing corporations, governmental agencies and, interestingly, also traditional energy suppliers. Within the US context this model has been described as *third party ownership* (Drury et al., 2012) and as a *leasing model* (Rai and Sigrin, 2013), while it has also been dubbed as *company control* model with a relatively small role for the consumer of electricity who is only providing the site of the micro-generation system (Sauter and Watson, 2007).

Finally, *community shares* business models, in which investors buy shares in communal local projects, are interesting for those without suitable conditions (e.g. rental house for solar PV placement) or with less money available for investment (Asmus, 2008), but such projects tend to have a highly local character. These community shares model have also been described for the German context as business models for investment in renewables with active citizen participation (Yildiz, 2014) and *civic corporate solar systems* (Dewald and Truffer, 2011). In many countries they have been also described as *renewable energy cooperatives* or *communities* (Docì et al., 2015). Within the US context, the model has been identified as *community solar* or *solar shares* (Asmus, 2008). Finally, in the US context, the model has been identified as *share-based model*, with further distinction into two different types (Hess, 2013).

These business models co-evolve with the broader socio-economic and regulatory environment. For instance the government may introduce regulations that affect profit opportunities for entrepreneurs, who in turn may follow new strategies (Provance et al., 2011). At the same time, success of a business model and lobbying of its proponents may actively shape regulation (Docì et al., 2015).

In this paper we view crowdfunding for renewable energy as a new business model, a novel socio-technical practice developed in a niche, with the potential to upscale and transform both the energy and the financial regimes. The socio-economic environment and the regulatory environment are putting pressure on the existing variety of business models, selecting thus at each moment in time some business models and actively (re-)shaping others (Huijben and Verbong, 2013). Previous literature has already treated novel business models as socio-technical practices developing in niches, by showing how a successful business model can acquire resources and 'grow' relative to less successful designs, by expanding to new customer segments (Jolly et al., 2012). Crowdfunding for renewable energy can be a disruptive innovation for both the energy and the financial regimes, but the extent to which this can materialize depends on a number of different factors discussed below (Section 2.3).

2.2. Crowdfunding as business model

Building on the upscaling potential of some of its predecessors, crowdfunding similarly can lower the barriers of initial investment. In crowdfunding, the expectation is that a large dispersed audience

(the crowd) provide small amounts of money, which accumulates in an investment large enough to finance a specific project (Lehner, 2013). We here use the definition of crowdfunding as the collective effort by people who network and pool their money together, via the internet, to finance projects initiated by other people or organizations (Ordanini et al., 2011). Moreover, it provides a relatively simple investment procedure and enables those previously excluded to be involved in PV and wind projects. Crowdfunding is not new, but the advent and use of social media have given a tremendous boost to crowdfunding (Harrison, 2013).

In addition, crowdfunding has been given a boost by several governments around the world as a response to the financial and credit crisis starting 2009. For instance, in the USA, the government passed the Jumpstart Our Business Start-ups (JOBS) act, which legalises certain forms of equity crowdfunding (Parrino and Romeo, 2013). This boost does not come without risks: the combination of investors who don't know much about the new business models with ventures and projects that are inherently risky suggest that crowdfunding needs to be approached with caution (Stemler, 2013).

Crowdfunding offers several opportunities for renewable energy projects. Aside from tapping into financial resources of users, and transforming the energy consumer into energy financier and producer, crowdfunding may bring in new types of customers, for instance individuals interested in experimenting with novel online tools. In addition, crowdfunding may facilitate societal support for renewable energy, which can translate in **political support**. In a study of crowdfunding for scientific projects it was found that it can encourage public involvement in the earlier stages of research and thus create long-lasting ties (Wheat et al., 2013). Related to this, crowdfunding can provide additional **legitimacy** to the renewable energy projects, since, as noted by Lehner (2013), "the selection process by the crowd is perceived as per se democratic" (p. 294).

Thus, there is empirical evidence that, in some cases, crowdfunding is not simply a "model to get funding for a business", but also about building public involvement, support and long-lasting ties (Wheat et al., 2013), building legitimacy and exploring new communication channels with clients (Lehner, 2013), community building (Gerber et al., 2009), experimenting with novel ownership structures model (Harrison, 2013), identifying potential demand for a proposed product and creating public interest in new products in the early stages of development (Mollick, 2014). In addition, through crowdfunding, the network of potential clients and/or funders can be expanded, both geographically (Agrawal et al., 2011), as well as socially (Mollick, 2014). All of these relate to the governance of transactions indicated in the business model definition in the introduction. In this respect, crowdfunding can go beyond financial resources for a project, to novel ways of governing transactions with clients, supporters and suppliers, and as such a distinct business model. Indeed, in a recent overview of sustainable business model archetypes crowdfunding was indicated as an organizational model with the potential to radically alter existing production and consumption patterns, with the internet as an enabler (Bocken et al., 2014).

Thus, crowdfunding renewable energy projects does not only have the direct impact of financing a project, but could also have a more indirect impact: creating a positive feedback loop of support for a renewable energy transition. This, however, has not been empirically investigated so far.

There are different crowdfunding models. Harrison (2013) mentions five distinct models:

- (i) Donation: contributors gain nothing, mainly focussing on charitable projects;

- (ii) Reward model: contributors are rewarded with a token in return for their funding, but no interest in the earnings, or shares.
- (iii) The pre-purchase model: similar to the reward model, but provides the contributor with the product that the financed project is developing, instead of any other token.
- (iv) The lending or peer-to-peer model: contributors expect return of their capital, (the principal being often interest bearing, or alternatively not).
- (v) The equity model, buying shares: contributors are offered a share in the business or a share in the profit stream.

In practice there are many variations to these basic models, as we will also show in the empirical section.

Lehner (2013) discusses crowdfunding of social entrepreneurship ventures⁸ and suggests that crowdfunding is especially important in such ventures in the start-up phase. In addition, he claims that crowdfunding may even have an additional positive impact, which is creating a “buzz in the social media” (Lehner, 2013 p. 297), drawing even more potential investors to the project. Nevertheless, active participation of the crowdfunders in the project cannot be taken for granted in all projects, nor is it stable over time in the stages of a crowdfunded project.

The heterogeneity in crowdfunding models is related to, and partly defines, motivations of contributors to crowdfunding projects. Individual motivations are important to assess the potential of such models, because they can indicate how to attract more crowdfunders, but also the limits of such models. We can expect crowdfunders in donation or reward platforms to participate because of altruistic or normative reasons, with an emphasis on the outcome of the project (Aitamurto, 2011; Mollick, 2014) or the feeling of belonging to a community (Gerber et al., 2009). In contrast, we expect crowdfunders in peer-to-peer or equity models to be mainly driven by financial considerations, investing their money with the expectation of gaining more in the future.

2.3. Assessing the potential of crowdfunding

Geels and Schot have introduced the following four proxies or criteria to assess whether a niche has stabilised and is ready to break through more widely:

“(a) learning processes have stabilised in a dominant design, (b) powerful actors have joined the support network, (c) price/performance improvements have improved and there are strong expectations of further improvement (e.g. learning curves) and (d) the innovation is used in market niches, which cumulatively amount to more than 5% market share” (Geels and Schot, 2007) (p. 405). Stabilisation of learning processes refers to the extent to which there is increasingly shared understanding of ways in which the niche innovation is organised, the technical specifications of the innovation, and the sociotechnical organisation of the niche innovation. Thus these learning processes cover socio-technical issues, not only by accumulating facts or data, but also by generating second-order learning about alternative ways of valuing and supporting the niche (Smith and Raven, 2012). Such a shared understanding can decrease uncertainties for investors, and increase public support. The last two proxies, price/performance improvements and market share, relate more to technological innovation niches, rather than new socio-technical practices, such as business models.

In addition, in a recent study of renewable energy communities as social innovations, the heterogeneity of the niches was introduced as an additional proxy for stabilisation of the niche (Docì et al., 2015). This refers to heterogeneity in terms of variety of actors involved, technological innovations they use, as well as broader conditions they operate. This is related to the fact that the breadth of the niche actor network is important for learning to occur: networks dominated by regime insiders hinder second-order learning and niche development (Hoogma, 2002). The important role of diversity of actors and local sites has also been indicated in Danish wind energy niche building (Raven, 2012).

We here look into heterogeneity in terms of the motivations of crowdfunders, employing the theoretical framework developed by Lindenberg and Steg (2007), who studied environmental behaviour and coupled motivations behind such individual behaviour with goal-frames, arguing that in every situation people want to achieve a goal that combines certain types of motivations (Lindenberg and Steg, 2007). The framework distinguishes among *hedonic goal frames*, when individuals want to improve the way they feel at the moment, *gain goal frames*, when individuals aim at increasing or protecting their resources, and *normative goal-frames*, when individuals behave in moral or ethical way, meeting norms expected by themselves or their community (Lindenberg and Steg, 2007). In every situation some goal frames are more prevalent than others, without this meaning that there is a unique goal frame guiding environmental behaviour. In communities that invested collectively in renewable energy, individuals were drawing from all three goal-frames at the same time, although one goal-framing tended to be prevalent (Docì and Vasileiadou, 2015). Heterogeneity of motivations is important, because, as indicated elsewhere, grassroots movements, with only ideological aims in mind (normative goal-frames) have a limited capacity to grow, as they have difficulties linking to regime actors and scaling up (Seyfang et al., 2014). Therefore, one of the elements we investigate in the empirical part is the motivations of individual crowdfunders, and especially the extent to which normative considerations are accompanied by gain and hedonic considerations.

Summing up, we look into crowdfunding as a novel business model, a sociotechnical practice developed in a niche, drawing from pre-existing business models in the energy market. There is some indication that crowdfunding can create a positive feedback loop of support, as the projects gain not only the needed financial resources, especially important in the start-up phase, but also broader social and political support, “word of mouth” buzz, and perceived legitimacy. There is considerable variety in the specific design of crowdfunding platforms, in terms of coordination of funding, the role of the funder and whether the funder can expect anything back for his/her contribution. These differences also relate to differences in the motivations of the participants in crowdfunding, whereby heterogeneity of motivations is important for scaling-up and attracting a larger pool of participants. This heterogeneity of motivations, alongside support from powerful actors and broader learning processes which contribute to stabilisation, can indicate the potential of crowdfunding to upscale.

3. Methodology

Drawing from previous studies (Docì et al., 2015; Geels and Schot, 2007) we study the proxies indicated in Table 1, below. Even though these proxies have been used previously (Docì et al., 2015; Seyfang and Haxeltine, 2012; Seyfang and Longhurst, 2013), there is no benchmarking available for any of these. Instead the

⁸ Social entrepreneurship ventures have a social or environmental mission as their primary goal, but aim to be financially and legally independent.

Table 1
Proxies and indicators used in the analysis.

Proxies	Indicators used
Scale	Amount of money Number of projects
Learning ^a	Shared understanding of the social practice Communication events around the platforms Networking events on renewables
Support	(Energy or Financial) regime companies in business model Governmental support at different levels
Heterogeneity	Heterogeneity of participants' motivations

^a The proxies we use for learning relate to the fact that established networks are very powerful for sharing experiences and building new partnerships. This relates to learning through interacting, which was identified before as essential for transition processes (Kamp et al., 2004), especially facilitated by intermediary organisations. We follow the distinction between local/individual knowledge and “global, abstract, generic knowledge that is shared within a community” (Raven and Geels, 2010). This global knowledge is created through aggregation, formalisation and codification of experiences (Geels and Deuten, 2006).

assessment of these proxies is generally based on thick description (Creswell, 2009).

Our empirical material is based on an overview of all online crowdfunding platforms in the Netherlands: we read all publicly available information on the successfully finalised projects on these platforms (see Appendix for the list of all crowdfunding platforms we examined). First, we identified those projects that were related to renewable electricity production. Only seven platforms had relevant projects. For these selected projects, we used online documentation to identify the amount of money invested, the amount of crowdfunders, and the number of successful projects over time (proxy 1, Table 1).⁹

For proxy 2, we read all publicly available material for the organisation of crowdfunding platforms and developments aimed to connect the different initiatives, such as associations, national conferences etc. to identify learning across platforms and degree of stabilisation, conducting document analysis. This was supplemented by 4 face-to-face qualitative open-ended interviews with experts in the field in spring 2014, where general developments on crowdfunding in the Netherlands were discussed¹⁰.

Regarding support and heterogeneity, we analyse in greater detail four platforms, which indicate the diversity of scale, support and heterogeneity (proxies 1, 3, 4): *Windcentrale*, *Oneplanetcrowd*, *Greencrowd*, and *1miljoenwatt*. In our case study selection we were guided by increasing variation in the variables (here the proxies), which can contribute to generalisation of qualitative data analysis (Weiss, 1994; Yin, 2013).

To identify the level of support (proxy 3), we analysed all online documentation, and the interview transcripts, about financial contribution or other type of support from different actors, and especially regime players from both financial regime, as well as the energy regime. To identify the crowdfunders' motivations (proxy 4), we collected all the online posts that (some) crowdfunders posted online for each project in our case studies, and conducted qualitative thematic analysis (Weiss, 1994), trying to identify the three goal frames (gain, normative and hedonic) discussed in the theoretical section (Lindenberg and Steg, 2007). This material is presented in the Appendix.

⁹ We collected all projects that were successfully finished until April 2014, and used the publicly available websites to collect this information.

¹⁰ Interviews were conducted with initiators of the crowdfunding platforms *Windcentrale*, *Crowdaboutnow*, *Greencrowd*, and the crowdfunding consultancy *Douw&Koren*.

Finally, the descriptions of the crowdfunding platforms, and the results sections of the paper were sent back to the experts for validation and additional information, as standard practice to attain validity in qualitative research (Creswell, 2009). As a second validity strategy, we used triangulation of different data sources (online documents, online posts, and interviews).

Windcentrale is the largest crowdfunding initiative in the Netherlands with more than €14 million collected, using the equity model. *Windcentrale* splits existing wind turbines in *wind-shares* of 500 KWh expected capacity each, and the individuals can, with a mouse click, buy a number of these wind-shares. The electricity actually produced by the wind-shares is deducted from the electricity tariff in the annual electricity bill. *Windcentrale* in essence creates a wind energy cooperative of crowdfunders for each windmill, but also runs the cooperative and the windmills for the life duration of the windmill. Until April, 2014, it has successfully sold wind-shares for 8 existing windmills, with 14,623 clients, and a total of 27,656,000 KWh production capacity (company data).

Oneplanetcrowd is the only reward-model platform related to broadly-defined sustainability projects. It is a “for profit” crowdfunding platform for environmentally or socially sustainable projects.¹¹ The platform assesses each potential project on the basis of, among other things, financial history and a business plan. The platform earns €200 per advertised project, and 7% over the final amount of money. The model is reward-based: the participants give money to the projects and, in exchange, receive a reward “in kind”.

Greencrowd is a platform combining both donation as well as investment crowdfunding for solar PV (combined donation-equity model). It is a non-for-profit foundation with an online crowdfunding platform for PV projects that started in October 2012. It analyses the projects and assigns them with a risk profile, setting standards for participation in the platform, and minimizing the risk for individual crowdfunders. Investors can decide on how long to finance and which amount they like to invest (i.e. for different interest rates), starting from €10. Participants can also indicate who receives the interest and initial deposit. Money can also be donated.

1miljoenwatt is a foundation which started to crowd fund using the equity model from June 2013 for placing of PV panels on a local football sports stadium in the city of Groningen. In November 2014, 531 panels were sold (292 k€) and the first PV panels could be installed on the roof.¹² In this project, people can buy ‘solar obligations’ of €550 which corresponds to one individual solar panel including maintenance. Every year people receive money from the electricity that their panels produced and which is sold to the football club. After 23 years they also get back their initial investment. The project received a subsidy from the national government to make it profitable. Additionally, the project, like all the other cases, could exploit a tax deduction scheme for investments in renewable energy. People can register online and have to pay 10% of the total investment in advance. In this way, the foundation aims to support and include people without large budgets or suitable roofs in buying PV systems.

4. Results

4.1. Scale

From Table 2 we can see that the total amount of money invested or donated to renewable energy projects through

¹¹ <http://www.oneplanetcrowd.nl/over>.

¹² This was followed by a second round, not included in our dataset.

Table 2

Overview of platforms with successful renewable energy projects. Hyphens indicate that no data is available.

Platform	Type of funding	Pre-existing business model	Amount of money	Average contribution	St. deviation
<i>Windcentrale</i>	Investment	Community shares	14,342,789	–	–
<i>Geldvoorelkaar</i>	Investment	Customer-owned/Third party	536,200	529	210
<i>Oneplanetcrowd</i>	Reward	all	375,560	881	287
<i>1miljoenwatt</i>	Investment	Community shares	292,050	1513	–
<i>Greencrowd</i>	Investment	Community shares	224,100	1389	1254
	Donation	Community shares	58,440		
<i>Symbid</i>	Investment	Customer-owned/Third party	50,000	327	–
<i>Doneerdezoon</i>	Donation	Third party	17,911	206	220
Total			15,605,000		

crowdfunding over the last 4 years¹³ is about €15.6 million, which is only a small fraction of the needed investments for the Dutch electricity system to switch to renewable sources.¹⁴ Nevertheless we need to take into account that the platforms are quite new, for instance for *Oneplanetcrowd* the €375 K euros reflect about one and half year of operation. In this respect the dynamic of crowdfunding for renewable electricity, defined as change over time (Vasileiadou and Vliegthart, 2014), holds potential.

Windcentrale plays a unique role as it represents 92% of the amount of money on renewable energy projects the last years. The resources raised through crowdfunding, without this “outlier” in the dataset, are limited (€1,262,211).

Further, we can see from the second column, Table 2, that the crowdfunding model most prominent is the investment model totalling €15,153,089. Reward-based funding accounts for €375,650, and donation accounts for €76,351 (exclusively on solar panels). The predominance of the investment model also suggests that the main motivations of crowdfunders would be related to financial gains. We explore this further in the four case studies below.

In the last two columns in Table 2 we indicate the average contribution per participant in each platform. The standard deviation suggests that for some of the platforms the average contribution varies greatly, with *Greencrowd* being a platform where contributions ranged from 10 euros to €6950. In some, the financial barrier for crowdfunding through these platforms (excluding *Windcentrale*) is very low, which is key for the success of crowdfunding.

In order to put these amounts in context, the volume of crowdfunding for renewable electricity production represents 21.8% of the total volume of crowdfunding since 2011 (€71.5 million), which is a substantial contribution.¹⁵ Therefore, in terms of total investments for renewable electricity, the scale of crowdfunding is minimal, whereas in terms of total crowdfunding volume in the Netherlands, the scale of crowdfunding for renewable electricity is substantial.

Comparing this typology, with the one we introduced in section 2.1 for existing renewable energy financing business models, we can see that crowdfunding builds on and expands pre-existing business models, as described in our typology in the

literature review. For instance *Geldvoorelkaar* facilitates peer-to-peer lending for individual ownership of solar panels, so the system remains customer-owned, yet the financing comes from a third party, and in this sense it draws from both models. *Windcentrale* uses elements from community shares, so investors buy shares in communal projects, the same with *1miljoenwatt*, but in the case of *Windcentrale* the projects are not local. But these categories are rather fluid and do not always fit the platforms well: two projects in *Oneplanetcrowd* followed the reward model to provide financing for a customer-owned (and third-party financed) windmill, whereas a third one provided the opportunity of the equity model, for a community shares model.

4.2. Learning

Online crowdfunding platforms have started only recently in the Netherlands. The oldest, *Windcentrale*, operates since 2010, while most operate after 2012. This would suggest limited opportunities, until now, for meetings, conferences, and exchange of best practice. This was confirmed by our four interviewees, who suggested that, there is very large diversity among platforms, for instance some aiming to create strong relationships to networks around each project, as condition of success, while others aiming to simply facilitate finance for renewables. One interviewee indicated that he doesn't consider the latter type as crowdfunding, but simply providing energy services. This indicates that there is limited shared understanding of what crowdfunding is among people in the field, and what its aim is or should be about. In addition, there is great diversity types of projects, often linked to path dependence: some platforms started with recreation projects, and they then host primarily these projects, other platforms host only solar or wind projects, especially when linked to energy providers, or solar panel companies. Thus, there is limited evidence of shared understanding of the novel socio-technical practice under study.

This is also evident when we examine networking and other communication events, because they are very recent. In February 2014, the platforms, together with consultancies in the market, established the Crowdfunding Association of the Netherlands (*Branchevereniging Nederland Crowdfunding*), with an aim to “strengthen and make the development of crowdfunding for business financing in the Netherlands more sustainable”.¹⁶ This association represents more than 95% of the market of crowdfunding platforms for company financing.¹⁷ The Ministry of Economic Affairs played a key role in facilitating its

¹³ The oldest initiative, *Windcentrale* exists since 2010, *Geldvoorelkaar* since January 2011, *Oneplanetcrowd* since October 2012, *Greencrowd* since October 2012, *Doneerdezoon* since June 2013.

¹⁴ Although precise quantitative data for investment needs have not been estimated for the Netherlands, an indication of how low this amount is, is the fact that in 2013 the Dutch government invested around €648 million for renewable electricity, which, among other factors, led to an increase of the share of renewable electricity to 4.5% of the total electricity in 2014 (RVO, 2013).

¹⁵ Data is available by Douw en Koren at <http://www.douwenkoren.nl/crowdfunding-op-weg-naar-mainstream/>.

¹⁶ <http://www.nederlandcrowdfunding.nl/>.

¹⁷ <http://www.crowdfunding.nl/branchevereniging-crowdfunding/>.

establishment as the government increasingly views crowdfunding as an additional source of financing for small and medium-sized enterprises, at a time when financing opportunities are limited.

Another recently established learning network relevant for crowdfunding is coordinated by the Netherlands Enterprise Agency. This is a network of financiers, such as banks, insurance companies, business angels and pension funds, including crowdfunding platforms, that aims to provide advice and support for start-up companies on sustainable energy.

In addition, other governmental institutions are attempting to create favourable conditions for crowdfunding. In 2011, the Netherlands Authority for Financial Markets (AFM) and the Dutch Central Bank clarified in a communication how the Law for Financial Regulation applies to the different types of crowdfunding. This communication identified the risks and financial obligations of crowdfunding platforms. Depending on the type of crowdfunding, a licence of operations needs to be obtained, or an exemption is allowed. This regulation, and the subsequent supervision of AFM act as a trust mechanism for the participants and guarantee some liability for the platforms.¹⁸

Part of the learning across some of these platforms takes place in a broader network of renewable energy initiatives in the Netherlands through workshops, seminars, newsletters and other events (see also *Docu et al., 2015* and *Huijben and Verbong, 2013*). This is especially the case for platforms such as *Greencrowd* and *1miljoenwatt*, which focus exclusively on renewable energy projects.

In sum, there is not much evidence of learning across the platforms yet, although several networks have been established or orienting themselves towards crowdfunding. When taking into account that most platforms operate since the last 2 years only, we expect this to change over time in particular when the Crowdfunding Association starts to shape mutual exchange and learning.

4.3. Support

In its starting phase, *Windcentrale* has been financially supported by both *Stichting Doen*, a major NGO in the Netherlands, as well as *Rabobank*, one of the largest banks in the Netherlands. In addition, it has had support from the Association of House Owners, *Greenchoice*, the largest green energy provider in the Netherlands, arranges the billing of the process. Thus there is support from financial, and housing regime actors, and one niche actor in the electricity sector.

Oneplanetcrowd started in 2012, as a partnership of several organisations: investment companies, investment consultancies, and a law firm, some of which are targeting specifically sustainability companies. Even though the partner organisations are numerous (nine in total), they are not very influential as regime actors in the energy (or financial) regime. There is no evidence of major support from powerful actors from the energy or financing regime.

The foundation *Greencrowd* is supported by their partner organization *Greenspread*, a commercial enterprise that provides knowledge (e.g. information memoranda to investors), back office services and money that enables *Greencrowd* to operate. There is no evidence of major support from powerful actors from the energy or financing regime.

1miljoenwatt has received support from several actors, including the municipality of Groningen, as well as *Essent*, an incumbent energy supplier which interestingly also became a member of the

alliance operating the business model. Thus there is some support from the electricity regime.

The role of the government in these initiatives is multiple. First, as discussed already, the government has supported the establishment of the main learning platform, the Association, and set a clear regulatory framework, through the supervising body AFM. These are facilitating conditions for crowdfunding to develop. In addition, some of these initiatives take advantage of existing subsidy schemes for renewable energy, like net metering support or tax deduction schemes.¹⁹ However, in general governmental support for renewable energy production in the Netherlands is relatively low and highly unstable (*Huijben and Verbong, 2013*).

In conclusion, evidence suggests support by energy and financial regime actors exists in some cases (*Windcentrale, 1miljoenwatt*), but not in others (*Oneplanetcrowd, Greencrowd*). General governmental support exists, and some of the platforms also take advantage of advantageous financial regulations related to renewable energy.

4.4. Heterogeneity

To identify the crowdfunders' motivations, we looked into the reactions that some participants posted online for each project. For *Windcentrale*, since there is no forum or blog dedicated to the crowdfunders' posts, we use the arguments promoted in the *Windcentrale* website, to deduce the types of motivations of the crowdfunders²⁰. The main advertising points are [italics added]:

"You can meet your own electricity demands in a *fun* and *simple* way; you use at home your own 100% *green* electricity from your own windmill; you don't suffer any more from rising electricity prices and you almost always *save money*"²¹

Therefore the crowdfunders in *Windcentrale* are expected to be a heterogeneous set of people, with different motivations, most prominently *normative, gain* and to an extent, *hedonic* considerations behind their investment decision.

In *Oneplanetcrowd* we identified *normative* and, in fewer cases, *hedonic* motivations, but an absence of *gain* motivations, since the platform is reward-based. In one of the projects, developing a new design prototype for a small scale wind turbine, the reactions can be grouped in three broad categories: contributing to the future and the environment (i.e. "For my children", "good for the environment"); being enthusiastic about a new wind technology ("As an ex-glider I find this an exciting innovation", "Promising sustainable technology"), and being part of something bigger ("Great to be part of a brighter future").

In *Greencrowd*, the crowdfunders' motivations were in line with the *gain* and *normative* goal-frames discussed in the literature review. A number of participants relate to the profitability of the investment, sometimes also by comparison to low interest rates provided by the bank ("The interest rate at the bank is low and I like solar energy"). Several individuals indicated they could not make an investment on their own house and therefore decided to join one of the projects ("I wanted to invest in solar PV

¹⁹ Net metering is the financial off-setting of Electricity taken from and provided to the grid on the energy bill.

²⁰ In the following cases we also noticed a close reflection between the stated purpose of the platform, and the motivations contributed by the crowdfunders themselves, which suggests that these stated purposes can be used as indicators of crowdfunders' motivations.

²¹ <https://www.windcentrale.nl/>.

¹⁸ <http://www.afm.nl/nl/professionals/diensten/starters/wet-regelgeving/crowdfunding.aspx>.

for months, but I rent a house where this is impossible”). The *normative* considerations relate to contributing to sustainability and the local economy, and being independent from traditional energy suppliers. Finally, the educational component and raising awareness is considered very important by a number of participants (“School sets a good example for students and their parents”).

In *1miljoenwatt* quotes from individuals were again in line with the *gain* and *normative* goal-frames, while motivations supporting the *hedonic* goal-frame were not identified. Again here, often the motivations are mixed (“It is always good to do something for the environment, a nice bonus is the good profit” or Nicer than my bank account and doing good as well!”). Motivations in line with the *normative* goal frame related to sustainability (“Acting sustainable and contributing to the new world”), as well as doing something for the next generations (We like to invest in a good environment for the future of our children). Independence from fossil fuel incumbents and freedom by self-production are also mentioned as drivers for investment (“My freedom, finally independent from fossil”), again suggesting a mix of *normative* and *gain* goal-frame.

Such reactions in some cases can also act as part of a marketing strategy, or corporate social responsibility when organisations and companies (and not individuals) fund the project. For instance, in *Greencrowd*, where a company invested money with the rationale “[it] fits to our company’s mission”. The large majority of crowdfunders, however, in all platforms are individuals.

In conclusion, in some platforms, more than others, crowdfunders exhibit large heterogeneity of motivations, related to *gain*, *normative* and to a less extent, *hedonic* motivations.

The summary of the analysis can be found in Table 3, in the following, concluding chapter. In our assessment we stay close to the evidence we have provided in the analysis.

5. Conclusions and discussion

This paper has reviewed crowdfunding initiatives in the Netherlands as an alternative source of finance in energy transitions. Our research question was: “To what extent can we see evidence of crowdfunding for renewable energy projects having stabilised as a niche and having the potential to break through the energy and financial regimes?” We can now draw the following conclusions (summarised in Table 3).

First, our analysis suggests that crowdfunding is far from routine practice. We have found some evidence of crowdfunding for renewable electricity niches, but the **scale** of crowdfunding remains very low compared to the funding needs for the transition of the electricity system. We also found limited indication of stabilization of **learning processes** until now. Evidence for **support** from regime actors is at this stage ambiguous, because

we only found regime support in some case studies (*Windcentrale* and *1miljoenwatt*). Finally, with respect to **heterogeneity** in funders’ motivations, *normative* and *gain* considerations prevail, while *hedonic* ones come less often, which echoes results from previous work on renewable energy communities (Doci and Vasileiadou, 2015). Moreover, reward or donation models seem to attract a primarily green crowd. All types of crowdfunding models were found, but the investment model was dominant.

Second, we show how crowdfunding draws some elements from preexisting business models, but brings novel elements to the fore. Similar to community shares business models, crowdfunding is about uniting citizens in renewable energy projects, thereby reducing perceived risk by the end user, since an external party is organizing the project and the AFM authority is, in most cases, overseeing the platform. Crowdfunding platforms are also reducing overhead costs for the users, by providing easy access to information on the projects and investment opportunities and a very simple subscription process, also for investors that are not geographically close to the project. Finally, similar to the community shares business model crowdfunding is enabling those without suitable roofs or high investment capital to join in renewable energy projects. At the same time, we also found indication of crowdfunding being similar to third party model, whereby donation or lending was used by a third party making the investment (e.g. school). Finally, crowdfunding was also building on (and extending) the customer-owned business model, in, for instance *Geldvoorelkaar*, which facilitates peer-to-peer lending. Therefore the different platforms showed how crowdfunding has built on an expanded all three pre-existing business models for renewable energy.

The extent to which we can generalize our results is an issue that arises in every comparative case study using qualitative analysis. It is true that the results are valid for the Netherlands only, since this was the focus of our study. In fact the strength of qualitative analysis lies in its particularity and not in generalizability (Creswell, 2009). However, generalizability in qualitative analysis can be ensured by the depth of the analysis, as well as the case study selection method, and especially if the case studies were drawn to maximize variance in the variables (Weiss, 1994); both are elements we have utilized in this paper. In addition, the extent of corroboration with other studies provide a degree of generalizability of our results, especially in relation to the coevolution of the new business model with governmental regulations (Huijben and Verbong, 2013), the heterogeneity of crowdfunders’ motivations (Belleflamme et al., 2013; Doci and Vasileiadou, 2015), and the fact that the novel business model borrows from pre-existing models (Harrison, 2013). The exploratory nature of our paper enabled us to develop, and utilize a framework which has proven useful, not only because of the depth of analytical material it generated, but also because of its theoretical embedding. This

Table 3
Summary of analysis.

Proxy	Results
Scale	Limited, but growing over time.
Learning	Limited evidence of shared understanding around novel socio-technical practice. Very recent networking organisations, with few events, for only some of the participants. Future potential on the basis of association establishment.
Support	Limited support from incumbent electricity regime companies. Some governmental support (depending on the platform)
Heterogeneity	Large heterogeneity of crowdfunders, on the basis of their motivations (depending on the platform)

framework can be used for assessment of crowdfunding in several other national contexts, which can help us better assess the potential of crowdfunding, and even provide some benchmarking for the novel practice.

Our research suggests two important venues for future research. First, a lot of rhetoric currently around crowdfunding has the implicit assumption of “small government” and “big society”, which suggest a contraction of government’s roles. In all our cases, though, the success of crowdfunding depended on governmental support. In some cases (e.g. *1miljoenwatt*) this support takes the form of removing the initial investment barrier, by creating favourable economic conditions, since many such initiatives depend on expectations of stable income, or at least no financial net loss (Doci and Vasileiadou, 2015). In other cases, there is more general support, as the government facilitated the establishment of the crowdfunding association, and regulates crowdfunding activities in order to protect potential investors. As a result, crowdfunding platforms have to make adaptations to their business model in order to comply with these regulations. These results are in line with previous work showing that governmental market regulation and support mechanisms are continuously shaping renewable energy business models in the market (Huijben and Verbong, 2013). Future research could explore in more detail to what extent crowdfunding reduces, maintains or increases public policy influence in energy markets.

Second, future research could explore developments, differences and similarities in different spatial contexts in relation to broader socio-economic and political conditions. In the UK, for example, collective buying and community shares projects are growing quickly, because of favourable governmental policies. The UK’s Government has enabled community energy projects to fix a tariff and defined eligibility criteria under the 2012 Feed-in-Tariff program review. Nevertheless, support for renewable energy community projects is lagging behind, and most projects are under-resourced (Seyfang et al., 2014). In this context, *Abundance*, a UK investment crowdfunding platform linking individuals and communities with renewable energy projects has raised \$10 million. In the USA, on the other hand, renewable energy policy is shaped by

again. There are plenty of market opportunities for financing renewable energy projects in the German market, with favourable regulations, and social support for renewable energy as indicated by hundreds of collective buying and community shares projects (not using crowdfunding) is generally large.²³ The German Feed in Tariff is designed in a way that most organizational forms, irrespective if they are private, community-owned or public, are able to benefit. Therefore, there may not be so much need for additional business models, such as crowdfunding.

Nowadays climate governance cannot be viewed or studied independently from energy governance, as the process of mainstreaming climate change in energy governance has already begun (Vasileiadou and Tuinstra, 2012). This means that for future climate and energy governance, engaging in a debate with the financial sector on the enabling conditions to close the funding gap for renewable energy transition is important. In this debate, crowdfunding can play a role, not only for enabling additional funding mechanism, but also by facilitating and providing societal support, which can translate in political support. For climate mitigation, the role of financial institutions has been to an extent underestimated (Geels, 2013). This discussion may lead to novel types of measures, such as measures supporting crowdfunding, for instance, by facilitating an online banking system. This would give the opportunity to crowdfunders to participate in financing renewable energy projects, not necessarily because they are the traditional “green” crowd, but because they see an interesting investment opportunity. Creating such broader investors base is key for successful transition.

As renewable energy has grown in several countries in the last decade, the field of sustainability transitions can benefit from turning to the financial mechanisms that can facilitate the spread of renewable energy. Exploring and understanding new business models as novel socio-technical practices, utilising existing theoretical frameworks, is key in this process.

Appendix

In the table below are the crowdfunding platforms whose project we searched, to find renewable electricity projects.

<i>Windcentrale</i>	Crowdaboutnow	Kapitaal op maat
<i>Geldvoorelkaar</i>	Share2start	Fundyd
<i>Oneplanetcrowd</i>	Seeds	The Dutch Deal
<i>Greencrowd</i>	Voorjebuurt	Duurzaam Investeren
<i>Symbid</i>	Wekomenerwel	Doneer de zon
<i>Doneerdezon</i>	Leapfunder	Sunny schools

Renewable Portfolio Standards (RPS) and tax incentives, which mostly ignore collective buying or community shares initiatives.²² Nevertheless, *Mosaic*, the leading solar crowdfunding platform in the USA, has raised \$8 million. The situation in Germany is different

Below we provide the list of contributors’ quotes for the projects we analysed. This material was analysed to identify the types of motivations, as explained in the methodology section.

²² Farrell, J., 2013. *Barriers and Solutions for Community Renewable Energy*, <http://www.renewableenergyworld.com/rea/blog/post/2013/09/5-barriers-to-and-solutions-for-community-renewable-energy> (Accessed 17.10.2013).

²³ Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE Stat), 2012. *Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland*. http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Bilder_Startseite/Bilder_Datenservice/PDFs_XLS/ee-energie-daten_ohne_formeln_2012.pdf.

Oneplanetcrowd	1miljoenwatt	Greencrowd
Green above everything.	Investing in a new industrial system that cares for men and nature.	Stewardship.
Super project!	If you want to pump out less gas, you need to get the energy from somewhere else.	Responsible stewardship.
Just cool idea and important to support innovation on natural energy generation.	Green, greener, greenest.	Fits very well to our company mission.
For my children.	Environment + saving money.	Sustainable project, wish of sports club SV Olympia to install panels on the gymnasium.
I think that this idea should get a chance. The article in the newspaper Vilkskrant 24 June 2013 made me curious. A small contribution is hopefully a big idea.	Environment.	I like to support/invest in sustainability.
The Netherlands can again become innovation country, from ancient windmills, to flying wind turbines.	I don't have the possibility to put solar panel myself, so that looked like a good solution.	More participants needed.
Great idea, challenging execution.	Corporate social responsibility.	Nice sustainable initiative, good return on investment.
Good for our next generation, good proof of Dutch power for innovation, what is good can always become better	With a nice view!	Nice sustainable initiative and good prospects for return on investment.
Good pitch on BNR.	As a gift to a 1,5-year-old girl, to learn early about being environmentally responsible.	I like to cycle on my race bike in this area. I would like to support clean electricity here, especially when I receive an attractive interest rate.
Fly high for sustainable power!	A greener future and a lower energy price, who wouldn't want that.	I like to support sustainable initiatives. On top of that the rate of return is higher than on a bank account, but that is of less importance.
Good project.	Living in a rental apartment.	A nice project in a municipality where I work.
Good initiative.	Everyone with a solar panel! This contributes truly to a greener Netherlands.	The more sustainable energy the less money flows to Vattenfall/NUON and will be spent here locally.
Great initiative! I invest with pleasure in this sustainable technology which is full of opportunities.	Stimulate sustainability.	Sustainability, green energy, for a better living environment.
I trust that the technology is feasible. I hope that also the organisational and bureaucratic challenges are overcome. A deep breath is important. I have my doubts with respect to danger for birds.	Now it will be 4 panels, because I trust that the project will succeed.	Support of a good initiative of my employer.
Wind turbines and beyond ...	Sustainability.	A contribution to a sustainable world and a new sustainable economy.
Great project that we support with pleasure with our investment.	Also in phase 2 solar panels, for a sustainable life.	I am very much inspired by CSR and hope that Rijnstate will strongly support this in the coming years.
Unfortunately I am bankrupt and don't have any more money. Still I want to participate in this sort of developments, and so I contribute to make it possible.	Being sustainable and contributing to a new world!	Contribution to sustainability.
A great innovation that I support with great pleasure! On the way to a sustainable economy!	An ideal project for someone like me, who lives in an apartment and still wants to be sustainable. I am enthusiastic!	Nice, innovative and acting together.
Beautiful and promising project.	The Future belongs to those who believe in the beauty of their Dreams.	Nice sustainable investment.
Even more enthusiastic after my visit earlier this week!	Good initiative and good investment.	Good to produce sustainable energy and to invest in a reliable manner.
Investing in sustainable energy is essential for now, but especially for the future.	Ideal way to generate solar energy if you don't have suitable roof!	Our mission is to help companies and private citizens with realizing their sustainable wishes.
A beautiful innovation that already works. Well on the way towards harvesting energy that is freely radiating to us.	Collective investing in sustainable solar energy, good for your and my future!	No space on own roof for more solar panels.
We want to invest in projects that improve the world!	Great initiative! I don't want any trouble with panels on the roof of the apartment. This way I can still contribute to sustainability.	Green initiative, involvement as employee and a nice rate of return as well.
Innovative, sustainable, promising.	One for two	Sympathetic initiative, innovative and good rate of return.
Good initiative, now upscale fast to mass production. What you think of small scale implementation for instance in our back yards? The early birds would love to participate!	I find this a good plan for sustainable energy.	Nice initiative.
Giving a boost to the development of wind energy.	Sustainable energy, yes!	Just fun to join as editor of Zorgvisie. (magazine for health care)
Where else can you invest that is so much fun?	No possibility to put solar panel myself.	A good initiative of my partner's employer. The rate of return compared to saving on a bank account is fine (considering current interest rates).
Very curious about how you will develop it for commercialisation!	On the way to more of these sustainable solar initiatives. Interest and sustainability go together.	Support of a good initiative of my employer. I can also make a nice rate of return.

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Oneplanetcrowd	1miljoenwatt	Greencrowd
Good for the environment.	The sun is the future. You can acknowledge this.	Financially attractive and better for the environment, do not have the opportunity myself to install panels.
Interesting development.	Green energy and self-sufficiency are for me and my girlfriend important. For now, the prices are very high. We hope to meet our own energy needs in this way, and eventually, to save energy.	Sustainable and green investment, therefore valuable.
Beautiful business! As an ex-glider I find this an exciting innovation.	Good for the environment. Contributing to the use of sustainable energy.	Sustainable investment and good interest rate. Use of sustainable energy sources is good for the environment. Schools are extremely suitable to bring this to the attention of children and parents. Together we are worth a lot, Harry.
I believe in new forms of energy.	We participate in a responsible and environmentally-friendly way to generate energy.	
Very promising sustainable technology. Energy is in any case a primary need and green versions are very much needed	Positive energy I don't have my own roof, I live in an apartment on the first floor. Otherwise I would put solar panels in my own roof. Nice initiative.	School sets example to students and their parents! So GREEN!
Good initiative!	Live in an apartment, so I don't have my own roof to put solar panels.	Good project, deserves to continue!
Interesting.	In the memory of Robert Long and for the future of my grandchildren.	This amount was raised by children of this school by a sponsored walk that was organized by the parents' council of the school.
Interesting project	Discount in my energy bill.	Norwin College aims at sustainability. Together with others we strive for a livable and healthy world and a sustainable economy. Employees and students VMBO-groen and MBO are going for it. To put energy into energy.
Actively contributing to setting up sustainable energy generation! Green and very promising!	Solar panels don't fit in our roof.	I want to invest for the last couple of months, but was unable to do so because I live in a rental house. Nice project of enthusiastic neighbourhood!
Good plan!	I find clean energy important, but I don't have a suitable roof. I don't have the option of my own solar panels, so this is a super-solution!	Good schools, that is what I want to contribute to as educational representative of the PvdA, but if I can contribute myself then I will do that! A really nice initiative that makes my green hart beat faster!
Belief in the concept, convinced of the need of sustainable energy.	A great initiative. My roof is unsuitable, and now I have a suitable roof at a distance!	Green projects and a higher interest rate than at my bank account ... besides that also a learning moment for the school ... good investment! Nice initiative of Stefano!
Brilliant initiative that I support from my heart	Investing in sustainable energy.	I think it is a nice initiative; we have solar panels ourselves and this results in substantial cost savings, so for such a school it is also attractive. Additionally you set an example to students. OBS Potmarge is my old school. My son is going to this school and who knows maybe later his children will go ... Therefore sustainable. The last bits also need to be collected, only less than 2000 euro to go!! Sustainable! Societal engagement and good investment. Achter de Hoven: Most sustainable neighbourhood of Fryslân!! (province of the Netherlands respectively) Investment in good education.
Great to be part of a brighter future.	Sustainable energy. less CO2 emissions.	
Contributing to a promising initiative for a beautiful world, of course I want that! Great initiative, which hopefully will make a difference!	Doesn't fit my roof and I find it a very nice and good initiative. Contributing to the environment.	
Fun project!	At home no space for solar panels.	
Interested, and who knows!!	Investing in green energy.	
I am curious where the wind will take Ampyx. It looks very promising! Supporting and actively participating in a project with likeminded people.	I am very positive about this project. Think green, own roof not suitable. Every contribution to the improvement of the environment helps.	
Endless powerful circle movement.	Sympathetic project through which I, as an apartment owner, still can purchase a solar panel.	
Fly like an early bird!	I believe in sustainable energy.	This donation is on behalf of my dad who supports the environment and education. He says this is going to work! All schools have to become sustainable. Good plans need to be financially supported.
Great initiative, potentially a game changer. Fun to contribute to an interesting sustainable initiative! Good luck with an especially promising project!	A truly sustainable interest rate. Good luck! Our own green energy without additional costs!	I want OBS Potmarge to become the First energy neutral school of Leeuwarden. (city in the Netherlands respectively) A good project to contribute to, nice!
Support new, innovative and sustainable technologies. Green = doing.	My own roof is unsuitable for solar panel, but I do want to invest in it. In this way I can do this. Small investment, because of little confidence in long term reimbursement.	Good luck with the last days of the campaign!
I support innovation-sustainability.	Maybe it contributes to a bit extra power to the FC [football team].	I support solar energy and it I believe that this is a good investment.
Let's hope that through this means we can drastically decrease the emissions of our race.	Great that the FC does this, I contribute with pleasure!	The interest rate at a bank account is low and I like solar energy.

(continued)

Oneplanetcrowd	1miljoenwatt	Greencrowd
What a contagious enthusiasm and what a courage! I wish Ampyx Power good luck with this technology. Clean Future.	The panels are a gift to my children who study and do not own their own roof yet.	Rate of return on green investment.
It can't be anything else but success! "Put your money where your mouth is", they say. Professional investors are happy to see that management also invests and that cannot be otherwise with crowdfunders! That is why I take the first 10.000 euros for my account ... and the 3 available early bird investments are still available for you!	Much more fun than my savings account, and doing good at the same time! Here comes the sun. As a beginner, with a small wallet I can now also generate solar energy with a few panels.	Nice project with a fine risk/return profile. I like to support sustainable solutions. Berni told me to do this.
The belief in combination of new and old technologies keeps our tradition alive! Good luck with the initiative.	For 14% sustainable energy everyone has to contribute.	A good sustainable initiative in combination with a nice rate of return.
I gladly contribute to a fantastic, modern application of a valuable piece of our tradition. Like this, you keep monuments alive! [The project] connects monument with sustainable energy!	I found out about it through friends of friends and I thought: why not! Simple way to start with solar energy. Good luck with the last panels!	Good initiative in the field of sustainability, in the neighbourhood of our residence and the expected rate of return. Sustainable energy needs as much support as possible. The more people become aware of this the more normal it becomes. I like to support sustainable initiatives. On top of that the rate of return is higher than on a bank account, but that is of less importance. I am looking for impact investment and investment in solar panels for communal buildings matches this ambition 100 percent. Trying it out.
Let the blades go round!	Now that I see everything works, I also participate in phase 2.	
Typically old Dutch but so much in our times!	I live in a rental, without any isolation, and still I want to contribute in this way!	
Old windmills that delivers green energy; beautiful.	Practical that you don't need to move the solar panels if you buy another apartment. Because together we can make a difference! I also want at some point solar panels in my own place. Unfortunately after my divorce I live temporarily in an apartment. This is for me a way to contribute with my own panel to a cleaner world. A beautiful future for our children.	Raise awareness with Dutch children and use this for helping others in need elsewhere.
Great initiative!		
Beautiful initiative!	Sun without trouble.	I support green projects anyway and I really like the educational component. Because we rent the earth from our children.
I am one of the initiators of EnergiekBaarn, I hope that many more windmills will follow. Good luck with the last 17%.		
We get happy by people that put their energy in sustainable energy with pleasure! Good luck! Green energy is important.	We already have some panels, and now some more. For the environment and our wallet. I want to contribute to a more sustainable world. This begins with action! I cannot put panels on my own house, but on Euroborg. Good initiative! In a more independent future, it is important to have your own capacity. Together we facilitate change. For the environment.	Important for now (lower energy costs school). Important for later (environmental). I find it amazing to be able to contribute to this.
Beautiful initiative. Fun to invest in. more historical mills should be used in this way. Beautiful project, good luck! Helping the windmills forward and getting something in return. Together you can do more.		Very nice project in the context of CSR. Nice initiative with nice artwork! Motivation happens when dreams start wearing their employment suits. Long live the students. Very nice initiative that Alliander loves to support.
The historical windmill is a symbol for new forms of energy: wind, sun, geothermal etc. Such a beautiful and visible mill that mills and generates energy and gets financed through crowdfunded can show us that people wants this. This makes me happy. All sustainable energy counts.	I already have green energy via Essent. But that energy I don't generate myself. My freedom, at last independent from fossil fuels.	Very nice project! Nice to see that MCA is highly committed to sustainability.
What a cool project! Energy from the mill. That makes me happy.	Just because.	I like to support green initiatives.
Great initiative to let an old windmill turn in a sustainable way. Beautiful project.	I want to contribute to the environment and sustainability. With pleasure we are investing for a good environment, for the future of our children! We are all astronauts in the spaceship Earth.	Idealism. I am in for all investments in sustainability.
Support of this excellent and sustainable initiative!		Good for the environment and contributes to a new society.
These windmills need to remain!	Make some profit from the sun, without any trouble. Ideal. And good for the environment. I participate with pleasure to a sustainable society.	Fits very well to our company mission: to help sustainable initiatives. Nice initiative to provide governmental buildings with panels
Great that a historical object will not turn into a static (and expensive) museum piece but it will continue to be used every day. That was the initial reason that these mills were actually built!		

(continued on next page)

(continued)

Oneplanetcrowd	1miljoenwatt	Greencrowd
I find it great idea to generate energy for a better environment with a traditional mill. Tonight I participated in a great Energy Pitch of Reggestroom. We are called to support this project so that sustainable energy can be generated, the miller in this historical mill can stay active and an iconic project in Hellendoorn can materialise. A great idea to kill two birds with one stone. Very nice initiative!! Good and innovating project that deserves support. The more wind energy the better. You wish a sustainable future to such a windmill. Keeping cultural heritage. Good idea to re-adjust an old technology. Regge-strom guarantees the last part of the needed financing. They have taken thus the decision that the generator will be installed and that this old mill indeed will generate new energy! We thank all the crowdfunders from Stichting Done! Greetings, Regge-stroom 30.000 euros from Stichting Doen for our mills! Hurray! The last bits towards the 40.000 euros! I support with pleasure green ideas. Excellent plan and a green lunch at Boshoeve is great! A fun company outing! My children ride everyday with the cart, an excellent means of transport! Charging with solar energy makes them completely climate-neutral. A very good cause!	The sun is shining for all of us, so energy is for all of us, with or without a roof. It is an interesting investment, an improvement of the environment and in the interest of Groningen, the Euroborg, and maybe FC Groningen. I find it an inspiring and stimulating project, for us this is the first step on the way to green energy and sustainable business for our postal company Regiopost O.Drenthe te Stadskanaal. = good project = reduction in our energy bill.	Sustainability lasts the longest.

References

- Agrawal, A., Catalini, C., Goldfarb, A., 2011. *The Geography of Crowdfunding* *.
- Aitamurto, T., 2011. The impact of crowdfunding on Journalism. *J. Pract.* 5, 429–445. <http://dx.doi.org/10.1080/17512786.2010.551018>.
- Asmus, P., 2008. Exploring new models of solar energy development. *Electr. J.* 21, 61–70. <http://dx.doi.org/10.1016/j.tej.2008.03.005>.
- Belleflamme, P., Lambert, T., Schwienbacher, A., 2013. Individual crowdfunding practices. *Ventur. Cap.* 15, 313–333. <http://dx.doi.org/10.1080/13691066.2013.785151>.
- Bocken, N.M.P., Short, S.W., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. *J. Clean. Prod.* 65, 42–56. <http://dx.doi.org/10.1016/j.jclepro.2013.11.039>.
- Boons, F., Montalvo, C., Quist, J., Wagner, M., 2013. Sustainable innovation, business models and economic performance: an overview. *J. Clean. Prod.* 45, 1–8. <http://dx.doi.org/10.1016/j.jclepro.2012.08.013>.
- Chesbrough, H., 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Ind. Corp. Chang.* 11, 529–555. <http://dx.doi.org/10.1093/icc/11.3.529>.
- Creswell, J.W., 2009. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Sage, Thousand Oaks.
- Creutzig, F., Christoph, J., Lehmann, P., Schmid, E., Blücher, F. Von, Breyer, C., Fernandez, B., Jakob, M., Knopf, B., Lohrey, S., Susca, T., Wiegandt, K., 2014. Catching two European birds with one renewable stone: mitigating climate change and Eurozone crisis by an energy transition. *Renew. Sustain. Energy Rev.* 38, 1015–1028. <http://dx.doi.org/10.1016/j.rser.2014.07.028>.
- Dewald, U., Truffer, B., 2011. Market formation in technological innovation systems—Diffusion of photovoltaic applications in Germany. *Ind. Innov.* 18, 285–300. <http://dx.doi.org/10.1080/13662716.2011.561028>.
- Docì, G., Vasileiadou, E., 2015. "Let's do it ourselves" Individual motivations for investing in renewables at community level. *Renew. Sustain. Energy Rev.* 49, 41–50.
- Docì, G., Vasileiadou, E., Petersen, A.C., 2015. Exploring the transition potential of renewable energy communities. *Futures* 66, 85–95.
- Drury, E., Miller, M., Macal, C.M., Graziano, D.J., Heimiller, D., Ozik, J., Perry IV, T.D., 2012. The transformation of southern California's residential photovoltaics market through third-party ownership. *Energy Policy* 42, 681–690. <http://dx.doi.org/10.1016/j.enpol.2011.12.047>.
- Eleftheriadis, I.M., Anagnostopoulou, E.G., 2015. Identifying barriers in the diffusion of renewable energy sources. *Energy Policy* 80, 153–164. <http://dx.doi.org/10.1016/j.enpol.2015.01.039>.
- Geels, F., Deuten, J.J., 2006. Local and global dynamics in technological development: a socio-cognitive perspective on knowledge flows and lessons from reinforced concrete. *Sci. Public Policy* 33, 265–275. <http://dx.doi.org/10.3152/147154306781778984>.
- Geels, F.W., 2013. The impact of the financial—economic crisis on sustainability transitions: financial investment, governance and public discourse. *Environ. Innov. Soc. Transit.* 6, 67–95. <http://dx.doi.org/10.1016/j.eist.2012.11.004>.
- Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Res. Policy* 31, 1257–1274.
- Geels, F.W., Schot, J., 2010. The dynamics of socio-technical transitions: a socio-technical perspective. In: Grin, J., Rotmans, J., Schot, J. (Eds.), *Transitions to Sustainable Development. New Directions on the Study of Long Term Transformative Change*. Routledge, London.
- Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. *Res. Policy* 36, 399–417.
- Gerber, E.M., Hui, J.S., Kuo, P., 2009. *Crowdfunding: Why People Are Motivated to Post and Fund Projects on Crowdfunding Platforms*.
- Harrison, R., 2013. Crowdfunding and the revitalisation of the early stage risk capital market: catalyst or chimera? *Ventur. Cap.* 15, 283–287. <http://dx.doi.org/10.1080/13691066.2013.852331>.
- Hess, D.J., 2013. Industrial fields and countervailing power: the transformation of distributed solar energy in the United States. *Glob. Environ. Chang.* 23, 847–855. <http://dx.doi.org/10.1016/j.gloenvcha.2013.01.002>.
- Hoogma, R., 2002. *Experimenting for Sustainable Transport: the Approach of Strategic Niche Management*. Taylor & Francis.
- Huijben, J.C.C.M., Verbong, G.P.J., 2013. Breakthrough without subsidies? PV business model experiments in the Netherlands. *Energy Policy* 56, 362–370. <http://dx.doi.org/10.1016/j.enpol.2012.12.073>.
- Jacobsson, R., Jacobsson, S., 2012. The emerging funding gap for the European energy sector—Will the financial sector deliver? *Environ. Innov. Soc. Transit.* 5, 49–59. <http://dx.doi.org/10.1016/j.eist.2012.10.002>.
- Jolly, S., Raven, R., Romijn, H., 2012. Upscaling of business model experiments in off-grid PV solar energy in India. *Sustain. Sci.* 7, 199–212. <http://dx.doi.org/10.1007/s11625-012-0163-7>.
- Kamp, L.M., Smits, R.E.H.M., Andriess, C.D., 2004. Notions on learning applied to wind turbine development in the Netherlands and Denmark. *Energy Policy* 32, 1625–1637. [http://dx.doi.org/10.1016/S0301-4215\(03\)00134-4](http://dx.doi.org/10.1016/S0301-4215(03)00134-4).
- Lehner, O.M., 2013. Crowdfunding social ventures: a model and research agenda. *Ventur. Cap.* 15, 289–311. <http://dx.doi.org/10.1080/13691066.2013.782624>.
- Lindenbergh, S., Steg, L., 2007. Normative, gain and hedonic goal frames guiding environmental behavior. *J. Soc. Issues* 63, 117–137. <http://dx.doi.org/10.1111/j.1540-4560.2007.00499.x>.

- Luthra, S., Kumar, S., Garg, D., Haleem, A., 2015. Barriers to renewable/sustainable energy technologies adoption: Indian perspective. *Renew. Sustain. Energy Rev.* 41, 762–776. <http://dx.doi.org/10.1016/j.rser.2014.08.077>.
- Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. *Res. Policy* 41, 955–967. <http://dx.doi.org/10.1016/j.respol.2012.02.013>.
- Mollick, E., 2014. The dynamics of crowdfunding: an exploratory study. *J. Bus. Ventur.* 29, 1–16. <http://dx.doi.org/10.1016/j.jbusvent.2013.06.005>.
- Ordanini, A., Miceli, L., Pizzetti, M., Parasuraman, a., 2011. Crowd-funding: transforming customers into investors through innovative service platforms. *J. Serv. Manag.* 22, 443–470. <http://dx.doi.org/10.1108/09564231111155079>.
- Parrino, R.J., Romeo, P.J., 2013. JOBS Act Eases Securities-law Regulation of Smaller Companies.
- Provance, M., Donnelly, R.G., Carayannis, E.G., 2011. Institutional influences on business model choice by new ventures in the microgenerated energy industry. *Energy Policy* 39, 5630–5637. <http://dx.doi.org/10.1016/j.enpol.2011.04.031>.
- Rai, V., Sigrin, B., 2013. Diffusion of environmentally-friendly energy technologies: buy versus lease differences in residential PV markets. *Environ. Res. Lett.* 8, 014022. <http://dx.doi.org/10.1088/1748-9326/8/1/014022>.
- Raven, R., 2012. Analyzing emerging sustainable energy niches in Europe. In: Loorbach, D., Verbong, G. (Eds.), *Governing the Energy Transition, Reality, Illusion or Necessity?* Routledge Studies in Sustainability Transitions.
- Raven, R.P.J.M., Geels, F.W., 2010. Socio-cognitive evolution in niche development: comparative analysis of biogas development in Denmark and the Netherlands (1973–2004). *Technovation* 30, 87–99. <http://dx.doi.org/10.1016/j.technovation.2009.08.006>.
- RVO, 2013. *Rapportage hernieuwbare energie. Deel 1*.
- Sauter, R., Watson, J., 2007. Strategies for the deployment of micro-generation: Implications for social acceptance. *Energy Policy* 35, 2770–2779. <http://dx.doi.org/10.1016/j.enpol.2006.12.006>.
- Schoettl, J., Lehmann-Ortega, L., 2011. Photovoltaic business models: threat or opportunity for utilities? In: Wüstenhagen, R., Wuebker, R. (Eds.), *The Handbook of Research on Energy Entrepreneurship*. Edward Elgar Publishing, pp. 145–164.
- Schot, J., Geels, F.W., 2008. Strategic niche management and sustainable innovation journeys: theory, findings, research agenda and policy. *Technol. Anal. Strateg. Manag.* 20, 537–554.
- Seyfang, G., Haxeltine, A., 2012. Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions. *Environ. Plan. C Gov. Policy* 30, 381–400. <http://dx.doi.org/10.1068/c10222>.
- Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., Smith, A., 2014. A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environ. Innov. Soc. Transit.* <http://dx.doi.org/10.1016/j.eist.2014.04.004>.
- Seyfang, G., Longhurst, N., 2013. Desperately seeking niches: grassroots innovations and niche development in the community currency field. *Glob. Environ. Chang.* 23, 881–891. <http://dx.doi.org/10.1016/j.gloenvcha.2013.02.007>.
- Smith, A., Raven, R., 2012. What is protective space? Reconsidering niches in transitions to sustainability. *Res. Policy* 41, 1025–1036. <http://dx.doi.org/10.1016/j.respol.2011.12.012>.
- Stemler, A.R., 2013. The JOBS Act and crowdfunding: harnessing the power—and money—of the masses. *Bus. Horiz.* 56, 271–275. <http://dx.doi.org/10.1016/j.bushor.2013.01.007>.
- Suzuki, M., 2015. Identifying roles of international institutions in clean energy technology innovation and diffusion in the developing countries: matching barriers with roles of the institutions. *J. Clean. Prod.* 98, 229–240. <http://dx.doi.org/10.1016/j.jclepro.2014.08.070>.
- Tomczak, A., Brem, A., 2013. A conceptualized investment model of crowdfunding. *Ventur. Cap.* 15, 335–359. <http://dx.doi.org/10.1080/13691066.2013.847614>.
- Vasileiadou, E., Tuinstra, W., 2012. Stakeholder consultations in the energy directorate; can they help integrate climate change? *Env. Polit.* 1–21 iFirst.
- Vasileiadou, E., Vliegthart, R., 2014. Studying dynamic social processes with ARIMA modeling. *Int. J. Soc. Res. Methodol.* 17, 693–708. <http://dx.doi.org/10.1080/13645579.2013.816257>.
- Verbong, G., Geels, F.W., Raven, R., 2008. Multi-niche analysis of dynamics and policies in Dutch renewable energy innovation journeys (1970–2006): hype-cycles, closed networks and technology-focused learning. *Technol. Anal. Strateg. Manag.* 20, 555–573. <http://dx.doi.org/10.1080/09537320802292719>.
- Weiss, R.S., 1994. *Learning from Strangers*. In: *The Art and Method of Qualitative Interview Studies*. The Free Press, New York.
- Wheat, R.E., Wang, Y., Byrnes, J.E., Ranganathan, J., 2013. Raising money for scientific research through crowdfunding. *Trends Ecol. Evol.* 28, 71–72. <http://dx.doi.org/10.1016/j.tree.2012.11.001>.
- Yildiz, Ö., 2014. Financing renewable energy infrastructures via financial citizen participation: the case of Germany. *Renew. Energy* 68, 677–685. <http://dx.doi.org/10.1016/j.renene.2014.02.038>.
- Yin, R.K., 2013. *Case Study Research: Design and Methods*. SAGE Publications.
- Zott, C., Amit, R., 2010. Business model design: an activity system perspective. *Long. Range Plann.* 43, 216–226. <http://dx.doi.org/10.1016/j.lrp.2009.07.004>.
- Zott, C., Amit, R., Massa, L., 2011. The business model: recent developments and future research. *J. Manage.* 37, 1019–1042. <http://dx.doi.org/10.1177/0149206311406265>.