

Smart financing and empowerment: the use of crowdfunding in the energy sector

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ABSTRACT

Crowdfunding in the energy sector responds to the pressing need of improving access to capital to support worldwide transition to a sustainable, low-carbon economy. Moreover, crowdfunding platforms are potentially able to expand the applicability of shared ownership and civic approaches in energy investments, as they aggregate financial resources as well as people on specific energy projects. This is an exploratory study into the nature of this emerging sector presenting results of the first worldwide systematic review of energy crowdfunding platforms. Evidence presented shows an emerging and empowering financial tool for investments in the energy sector. Initially developed as a socio-technical practice for civic energy approaches, it is already showing signs of scaling up and of turning into a new viable business model for distributed energy investments.

1. Introduction

The lack of access to credit and other financial services is increasingly recognized as one of the biggest obstacles to socio-economic development and poverty reduction (Kelly and Rhyne, 2015). More recently, the financial crisis have reduced credit opportunities for citizens and firms, triggering attempts to reform the finance system in order to better respond to the needs of the real economy and to support economic growth and development (ESMA, 2015b, EU Commission, 2015, UNEP, 2015). In this context sits the growth of crowdfunding, a novel financial tool which allows a project, an organization or a company to raise money from the general public for seed finance, products

development or social causes through open calls via the internet. It is a relatively new phenomenon, beginning to spread mainly in USA and Europe, around 2008 and steadily growing since.

Despite its novelty, it is already becoming a valuable alternative source of funding for entrepreneurs and innovators (Massolution, 2015). The number of platforms have been dramatically increasing worldwide as well as the funding volume (moving from about \$53 million in 2010 to over \$16 billion in 2014 (Massolution, 2015)), it is increasingly recognised by institutions such as European Commission and World Bank (ESMA, 2015a, EU Commission, 2014a, EU Commission, 2014b, World Bank, 2013) and has recently attracted the interest of academic scholars. The academic literature on the topic is only nascent, with most of the peer reviewed research so far focused on investigating crowdfunding from a business and management point of view, with a particular attention to the role of crowdfunding in financing the development and growth of small and medium-sized enterprises, such as start-ups and innovative ventures. Several contributions have analysed either entrepreneurs incentives to use crowdfunding (Belleflamme et al., 2014, Cordova et al., 2015) or sponsors' motivations to invest (Ordanini et al., 2011, Burtch et al., 2013, Gerber et al., 2011, Xu et al., 2016), or the dynamics behind success and failure of crowdfunded ventures (Belleflamme et al., 2013, Cordova et al., 2015, Hörisch, Mollick, 2014, Kuppuswamy and Bayus, 2015).

I take a different perspective by assessing the potential of crowdfunding as innovative financing tool in a specific sector: the energy industry. Recent contributions have highlighted the importance of the role of the financial system in supporting sustainable energy transition (Hall et al., 2016, UNEP, 2015, Robins and McDaniel, 2016), but no academic contributions have yet looked into the potential role of crowdfunding in responding to such imperative. In order to do so this paper aims at shading some light on the use of crowdfunding in the energy sector, by presenting results and analysis of the first worldwide systematic review of energy crowdfunding platforms.

In what follows I firstly highlight the disintermediation and people empowering potential of crowdfunding and the enabling drivers for its use to energy sector. Then I analyse the dynamics of this emerging sector by presenting and discussing evidence on how crowdfunding has been used in the energy industry.

2. Crowdfunding and empowerment

The concept of raising money through general public is not new in socio-economic systems (Wadrop et al., 2015). What specifically characterizes crowdfunding is the use of internet and dedicated web platforms where projects are presented to the public and through which people can donate or invest money. This has been made possible by the widespread adoption of information and communication technology (ICT) and the progressive increasing use of technology-enabled social networks to interact and connect online (Pew Research Center, 2014). Crowdfunding provides a direct way for people to connect to projects proponents and chose among investment options, without standard financial intermediaries (Mollick, 2014, Cordova et al., 2015).

Indeed, crowdfunding platforms are not only an alternative source of funding, but also communication tools, as they allow full transparency and open communication on projects and enable investors to engage with the project proponents, get involved and monitor progress over time. Thus, consumers and investors can not only benefit from rewards offered by project proponents in exchange of financial contributions, but also actively participate to online communities, sharing information and providing

suggestions (Mollick, 2014, Ordanini et al., 2011). Crowdfunding is thus a form of democratization and disintermediation of financing made possible by the use of internet and social networks which allow people and potential investors to directly browse investment options and to communicate among themselves. As such it can be an empowerment tool, positioning people at the centre of economic and financial processes.

3. Enabling drivers in the energy sector

The use of crowdfunding in the energy sector begins in 2012, in a context of reduced investments into the transition to decarbonized energy systems (Geels, 2013) and the pressing need to improve access to capital to support worldwide transition to a sustainable, low-carbon economy (Robins and McDaniel, 2016, UNEP, 2015). Moreover, the strong transformation in the energy systems since the late 90s (due to restructuring and liberalisation of the industry on one hand and the need to decarbonize energy systems by increasing the proportion of renewable distributed generation on the other) has allowed smaller size investments (than centralized generation plants) and the entrance in the energy market of new generators and investors (including citizens, local authorities, small firms) previously set outside of the industry mainly dominated by large energy companies (Kempener et al., 2015). Decentralised energy is now part of governments' and societies' 'localism' agenda, as citizens, communities, firms, local authorities and other public sector organizations can become energy producers and not only 'passive' users of a service delivered. As such, they could fully harness benefits and incomes originating from energy investments implemented in their premises and territory. Indeed, the last decade has seen the increasing development of community energy and shared ownership approaches for investments in the energy sector worldwide (ILO, 2013, van der Schoor and Scholtens, 2015, Yildiz, 2014, Funkhouser et al., 2015). In other words, the ongoing transformation of energy systems has allowed the progressive growth of a 'civic energy sector' which, adopting Hall et al. definition, "*comprise citizen, community, co-operative and municipal ownership of energy systems [...] beyond market and state*" (Hall et al., 2016). Civic energy approaches are new business models and structures conducive of greater participation of citizens and communities in energy projects, as such are a form of democratization of energy investments and policy.

A distinctive feature of crowdfunding, besides pooling capital as factor of production, is its potential of turning consumers and citizens into participatory actors, as well as investors (Belleflamme et al., 2014, Cordova et al., 2015, Ordanini et al., 2011). Such characteristics make crowdfunding platforms a potentially powerful tool to expand the applicability of participatory and shared ownership approaches in energy investments, as it can aggregate financial resources as well as people on specific energy projects. Several contributions have been pointing out how civic energy schemes are often under-resourced (Seyfang et al., 2014) and lacking of sufficient access to finance to scale up activities (Phimister and Roberts, 2012, DECC, 2014). Others have highlighted the importance of the financial institutions for the emergence of civic energy schemes, in particular by pointing out how more locally oriented banking institutions tend to favour their deployment (Hall et al., 2016).

Therefore two research questions arise: 1. Is crowdfunding a people empowering financial tool in the energy sector?; 2. could it help and support the expansion of civic and participatory energy approaches?

The form of involvement and the benefits for the investor accruing from the participation in crowdfunded energy projects can change considerably according to the type of crowdfunding model

chosen and the type of projects proposed (Belleflamme et al., 2014). Indeed, there exists several types of crowdfunding models (EU Commission, 2014a, Massolution, 2015, Pais et al., 2014, World Bank, 2013) which, for the purpose of this study, are grouped in two overarching categories, which differentiate themselves on the basis of the relationship between those who provide financial resources and those that receive the funds:

1. Non-financial or donation crowdfunding, where individuals' contributions are not associated with a financial return. These are mainly *donation* and *reward* crowdfunding platforms.
2. Financial or investing crowdfunding, where financial instruments are sold in relation to companies assets and/or financial performance. Main financial models are *lending* (where funders receive a debt instrument that specifies future terms of payment, usually a fixed rate of interest) and *equity* platforms (where funders receive an equity instrument or a profit sharing arrangement, thus participate of business activities and risks).

In what follows I present and analyse results of a systematic review of the application of crowdfunding to the energy sector, looking into how the different crowdfunding models have been used, for which type of projects and for which level of investors' involvement and participation in the projects.

4. Results of systematic review of energy crowdfunding platforms

The application of crowdfunding to the energy sector has been relatively recent, with the first relevant platforms and campaigns beginning to appear in 2012. Since then the number of initiatives and platforms have been increasing overtime. By October 2015 twenty nine energy crowdfunding platforms were active with projects online (summary of relevant information in Annex 1) and thirteen new platforms in the pipeline. All energy crowdfunding platforms are specifically focused on clean energy, offering investments in renewables energy projects from a mix of technologies, including solar photovoltaics, wind, biomass, hydropower. Over 80% of the twenty nine active platforms are financial/investing platforms with the remaining 20% dedicated to non-financial/donation models.

The financial platforms follow either *lending*, *equity* or *hybrid* models of crowdfunding. Through *lending* platforms investments in renewable energy projects are solicited online providing the investor with a debt instrument which is then repaid and remunerated over time as a function of the revenues generated by the project. The *equity crowdfunding* platforms tend to support more participatory approaches as they generally offer a form of *community shares*: investors give money in exchange of shares of the legal entity making a specific investment (usually a company or a cooperative), as such not just benefiting from returns on the investment itself through dividend payments, but also acquiring rights to participate to the legal entity activities (SpaceTec Capital Partners, 2014). Most of these platforms focus on community based projects, with a strong geographical characterization and with the explicit aim of improving the participation of local communities in the renewable energy investments accruing in their territories. *Hybrid platforms* allow investors to choose among different types of investing options: debt instruments, bonds, company equity or shares in local cooperatives. The *non-financial/donation* platforms are strongly socially oriented, providing renewable energy projects to communities and no-profit sector in their respective countries or to support rural electrification in developing countries.

Of the financial ones a good majority adopted the lending model (~60%), some the equity/community share model (~25%) and the remaining have adopted hybrid models (~15%). Platforms performances differ quite substantially (see Annex 1), in terms of both number of projects and amount of money raised. Nonetheless, lending model is not only the more frequently applied by energy crowdfunding platforms, but it's also the best performing. Lending projects have been the highest in numbers, raised the largest amount of money (over 75% of the total raised to date) and for largest average project size (Table 1).

Table 1. Performance by crowdfunding model

Model	Number of projects	Money raised €	Average raised per project €
Lending	219	127,555,407	768,406
Equity (community shares)	38	22,740,049	733,550
Hybrids	40	13,949,090	348,727
Donation/reward	93	814,883	14,050

United Kingdom stands out as the market leader, in terms of number of projects and money raised (this is not surprising, considering its leadership in the wider European crowdfunding market, accounting for a market share of over 74% in 2014 (Wadrop et al., 2015)). Netherland follows, with the next highest figures in terms of money raised, then USA and Germany whose numbers fall in a similar range.

Up to October 2015 the energy crowdfunding sector has overall raised about €165millions, which accounts for only 0,75% of the crowdfunding funding volume cumulated worldwide roughly over the same period of time (i.e. almost €23billions, raised since 2012) (Massolution, 2015). However it is interesting to notice that, despite being a still quite small market, the size of energy crowdfunding campaigns is almost double than the average wider worldwide crowdfunding (Figure 1). And this pattern is consistent across all models.

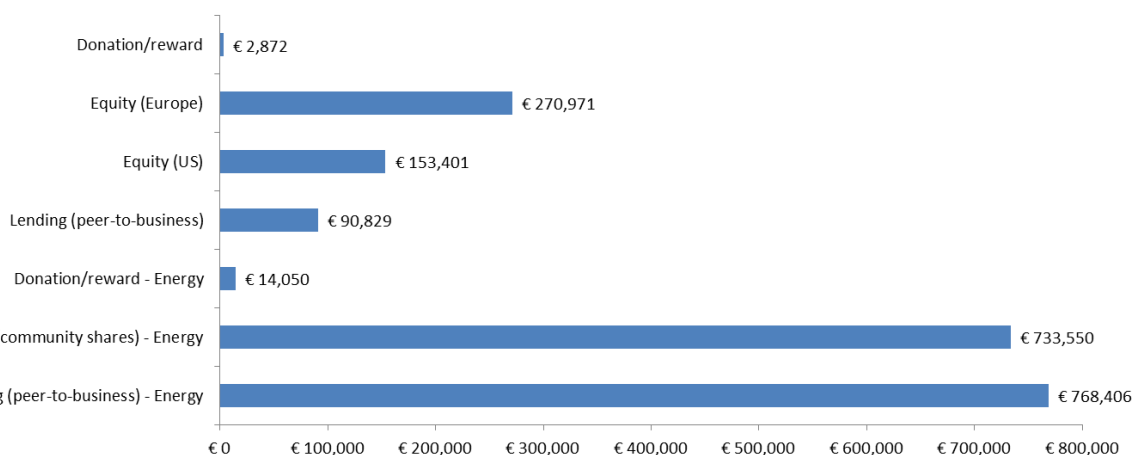


Figure 1. Comparing average crowdfunding campaign size, by model

Source: Author's elaboration, (Massolution, 2015)

Moreover, the energy crowdfunding campaigns are also on average more successful. Figure 2 shows much higher success rates (the percentage of the published projects which get successfully funded) for energy crowdfunding projects than wider crowdfunding averages, and across all models.

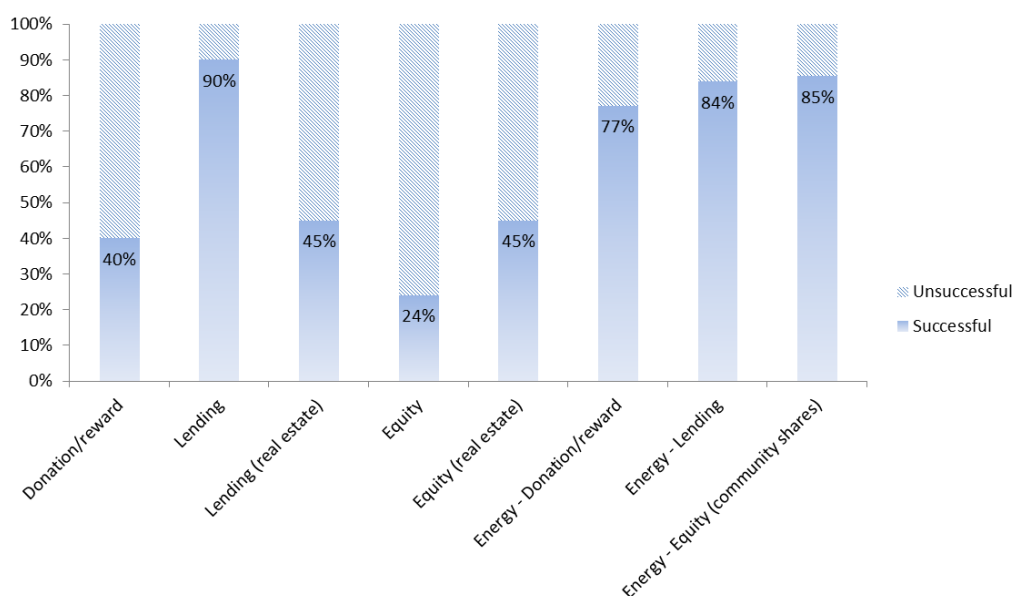


Figure 2. Comparing average success rate, by model

Source: Author's elaboration, (Massolution, 2015)

5. Discussion and conclusions

My analysis of the evidence gathered on energy crowdfunding platforms pictures a very new, but quite dynamic sector. The crowdfunding tool has been applied in most of its forms, ranging from lending to pure donation platforms, with financial models accounting for the majority of the online platforms. The strong environmental mission is a common place, with all platforms focusing on clean energy projects and most of them explicitly shaping their project scouting and communication strategy emphasising the environmental and ethical dimension of the initiative.

The use of crowdfunding in the energy sector has begun as a fairly niche application to small/medium scale and civic energy projects, with the explicit aim of increasing participation of citizens in renewable energy investment. First ground-breaking campaigns are those launched by platforms such as WindCentrale (Netherlands), an equity crowdfunding platform (offering community shares) which in 2013 managed to raise €1.3 million in less than 13 hours from 1700 households in the Netherlands to finance a community owned wind turbine (Reitsma, 2014, Bayar, 2013). However, the

systematic review has also shown how equity/community shares (formally the most participatory crowdfunding model, as investors directly buy shares in energy projects) is not currently the most popular nor the most performing. Lending platforms, which bring forward ‘third party’ business models (where investor give money to a third party making the investment (Huijben and Verbong, 2013)) are instead the mostly used in crowdfunding and raised the largest amount of money to date. A recent European survey (Figure 3) also highlight how the majority of projects have been proposed and developed by private sector stakeholders, either limited companies or energy service companies (Klaes, 2015). In other words, crowdfunding has been widely used by energy project developers to finance their new investments in the sector.

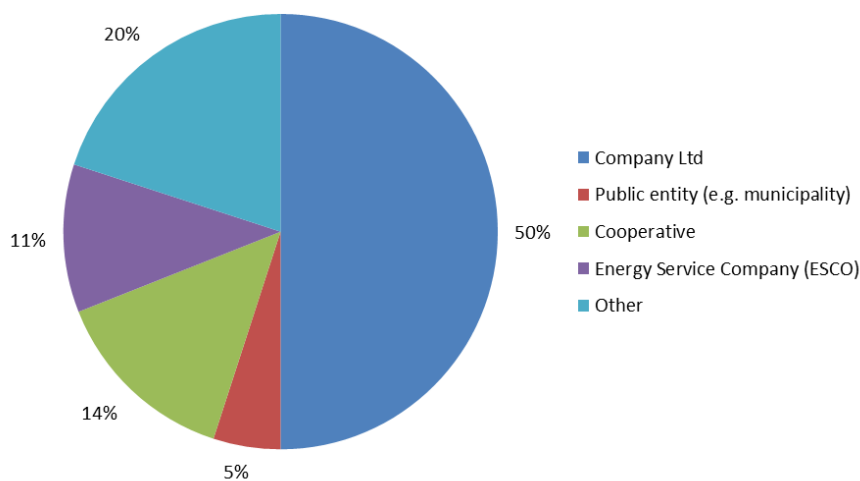


Figure 3. Company structure of projects proponents

Source: Author’s elaboration, (Klaes, 2015)

Nonetheless, despite bringing forward formally less participatory business approaches than community shares for the implementation of renewables and energy efficiency measures, lending platforms still allow people to invest in green energy projects in a disintermediated manner (as people can transparently chose where to invest and do it directly) and for small amounts of money. They thus provide the possibility to those interested in investing in clean energy, but without suitable conditions (e.g. when they lack of sufficient capital or of a suitable area to develop the project) to invest, directly contribute to CO₂ emissions reduction and benefit from the returns on the investment. A clear example is Abundance Generation (one of the largest United Kingdom platforms), which is allowing citizens to invest in renewable energy projects with as little as £5 investment since 2012 (Abundance Generation, 2014). Moreover, several lending platforms (such as Lendhosphere (France), LeihDeinerUmweltGeld (Germany) or DuurzaamInvesteren (Netherlands)) have managed to successfully raise millions of euros in renewable energy projects with explicit community and local focus (e.g. Lendosphere raised about 50% of the money among local people offering them higher returns than other investors (Blais, 2015)).

The environmental and participatory connotation of energy crowdfunding platforms is likely to be one of the main determinants of higher success rate to energy crowdfunding campaigns than worldwide averages (see Figure 2). Available evidence shows that in the energy sector funding from local population is more easily raised, and potentially lower returns is counterbalanced by the possibility of being involved in the project with some sort of participation or control rights (Yildiz, 2014, Dóci and Vasileiadou, 2015). More generally, crowdfunding initiatives that are structured as non-profit organizations tend to be more successful than other in achieving fundraising targets (Belleflamme et al., 2013, Mollick, 2014). However, energy platforms also offer interesting monetary returns on the investments (on average in the 4% to 7% range), thus the environmental and participatory motivations are not the only driver. Further work would be needed to analyse energy crowdfunding investors' profile and their drivers to invest, particularly looking at how environmental and social components balance out with monetary returns in driving investment decisions.

In conclusion, the evidence I've presented picture crowdfunding in energy as an innovative and people empowering financing tool in the energy sector, allowing transparent, direct and disintermediated investment in clean energy projects. Initially developed as a socio-technical practice in the niche of civic energy approaches, it is now also showing signs of scaling up and of turning into a new business model, which could help in fostering and scaling up distributed energy solutions in the future (Bocken et al., 2014, Vasileiadou et al.). As wider crowdfunding (which, despite beginning as a grass root phenomenon, has quickly scaled up and has been increasingly used by established businesses to finance growth and expansion activities (Lehner, 2013, Mollick, 2014)) the energy crowdfunding sector seems to be moving from small/medium locally characterized energy projects to larger projects, from energy cooperatives to private sector led campaigns often launched to support the expansion of renewable energy companies rather than single community projects (in particular in the United Kingdom).

Table 2. Trillion Fund performance, by project type

Trillion Fund	Equity	Community shares	Loan	Fund
Money raised €	4,747,208	6,972,470	34,017,910	56,358,206
Number of projects	1	9	13	3
Average return	9.5	5.29%	7.34%	15.13%
Average raised per project €	4,747,208	774,719	2,616,762	18,786,069

Note: Successful 'Fund' projects are in reality six, but three have not been included as data on amount of money raised is not available online.

A clear example is the performance of the worldwide leading UK platform, Trillion Fund, which highlights the role of institutional finance in scaling up the sector: over 50% of the total funding volume of the worldwide energy crowdfunding sector (about €90 millions) has been raised only by campaigns launched on Trillion Fund in the last couple of years by renewable energy companies and investment funds (Table 2). On the other end of the spectrum sits Village Power in the USA, an equity crowdfunding platform which has more than 130 civic energy projects under development of sizes ranging from as little as 20,000\$ to millions of US dollars (Village Power, 2016). Whether civic energy approaches will coexist with more structured finance instruments in the scaling up of the sector is an open question to which we will get an answer only in the years to come. Moreover, the role that this novel and innovative financing tool will play in facilitating the transition of the energy sector towards

distributed energy investments, in particular in respect to the other institutional financing channels, will definitely merit the attention of academic scholars in the future.

6. Methods and data

This is an exploratory empirical study of the nature of crowdfunding in energy, an emerging sector for which almost none evidence has been provided yet. The data gathered and their analysis rather than testing formal hypothesis have the main objective of providing evidence base for future assessments and theory building. Indeed, systematic reviews are increasingly used to provide robust evidence to scholars and policy making in several sectors, including energy (Gross et al., 2013, Slade et al., 2011). They are based on explicit and transparent methodologies (which also need to be replicable and updatable) for searching and synthesising available primary research and data (Sorrell, 2007, Thomas et al., 2013). For the purpose of this study the systematic review of energy crowdfunding is based on (Sorrell, 2007):

- A clear definition of the scope of the analysis;
- A systematic and exhaustive searching of the available literature;
- The application of explicit criteria for the inclusion or exclusion of studies and data;
- An objective summary and synthesis of the results.

The scope of the review is: eliciting evidence on the use crowdfunding in the energy sector, with particular attention at how it has been declined across different crowdfunding models and how it has been performing to date. Peer reviewed primary research in this specific field is almost inexistent, thus major sources of information have been grey literature, crowdfunding platforms and websites.

Energy crowdfunding platforms have been searched for and selected through analysis of online grey literature (McCann, 2013, Renewable Energy Crowdfunding Conference, 2014, Solarplaza, 2014a, Solarplaza, 2015, Solarplaza, 2014b) and systematic web browsing running Boolean keyword searches for the terms 'energy', 'renewables', 'crowdfunding', 'community shares', 'equity', 'solar', 'wind', 'biomass', 'energy efficiency', 'shared ownership'. The platforms identified and included in the review have at least one project focused on energy and, if not active yet, express clear focus on the energy sector in their mission. Such systematic review has allowed identifying 42 energy related platforms worldwide. Through close read of information provided on the platforms and searches of related online literature (including crowdfunding and energy related online magazines and conferences proceedings) a data set has been constructed with platforms' descriptive data and characteristics including: country of origin, date of launch, crowdfunding model, technology focus, number of projects, money raised, benefits and returns offered to the investors. Then information and material published for each project published on all active platforms (i.e. the published material on each project web page) has been closely read to build up a data base of 389 energy crowdfunding campaigns, accounting for several variables including: project name; location; technology type; opening and closing date of the campaign; target and amount of money raised; type of investment offered; returns guaranteed. When information given on the platform website or on a specific project page were not sufficient, online keyword searching were run to search for additional evidence on online grey literature. Data gathered provide a static picture of the sector in October 2015, but the methodology and database produced are potentially updatable to account for progress over time of the market.

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ANNEX 1

FINANCIAL PLATFORMS					
Platform	Model	Investor's benefit	Number of projects	Money raised (€)	Country
Abundance Generation	Lending	% of the revenue or profit generated by the projects	23	13,526,367	United Kingdom
Mosaic	Lending	% of the revenue or profit generated by the projects	20	5,785,414	USA
LeihDeinerUmweltGeld	Lending	% of the revenue or profit generated by the projects	19	4,029,050	Germany
Econeers	Lending	% of the revenue or profit generated by the projects	10	3,915,150	Germany
DuurzaamInvesteren	Lending	% of the revenue or profit generated by the projects	9	2,892,000	Netherlands
Bettervest	Lending	% of the revenue or profit generated by the projects	31	1,774,240	Germany
Lendosphere	Lending	% of the revenue or profit generated by the projects (higher % returns for investors living in the project area)	16	1,446,990	France
We share Solar	Lending	% of the revenue or profit generated by the projects	8	1,075,574	Netherlands
SunFunder	Lending (for rural electrification)	% of the revenue or profit generated from the sale of the electricity produced by the project	34	986,238	USA/Tanzania
GreenVesting	Lending	% of the revenue or profit generated by the projects	9	970,950	Germany
GreenXmoney	Lending	% of the revenue or profit generated by the projects	13	277,550	Germany
CollectiveSun	Lending (for no profit projects)	% of the revenue or profit generated by the project	4	254,769	USA
Lumo	Lending	% of the revenue or profit generated by the project, plus use of the electricity generated	6	185,000	France
Enerfip	Lending	% of the revenue or profit generated by the project	1	60,000	France
WindCentrale	Equity (Community Shares)	Financial returns proportional to the share owned, plus use of the electricity generated	9	14,300,000	Netherlands
Village Power	Equity (Community Shares)	Financial returns proportional to the share owned	13	5,202,674	USA
Microgenius	Equity (Community Shares)	Financial returns proportional to the shares owned	2	1,436,458	United Kingdom
Gen Community	Equity (Community Shares)	Financial returns proportional to the share owned, plus surplus income reinvested in the community	2	1,351,516	United Kingdom
Coopernico	Equity (Community Shares)	Financial returns proportional to the share owned	7	267,600	Portugal
Crowdener.gy	Equity (Community Shares)	Financial returns proportional to the share owned	5	181,800	Germany
Trillion Fund	Hybrid (Lending, Equity, Community Shares)	Returns vary in accordance to the financial tool chosen (bonds, community shares, equity, funds)	29	102,095,794	United Kingdom
Greencrowd	Hybrid (Lending, Equity)	Returns vary in accordance to the financial tool chosen (loan or equity)	23	2,097,040	Netherlands
Veolis	Hybrid (Lending, Reward)	Returns vary: % of the revenue or profit generated by the projects (Lending) or rewards provided (Reward)	3	77,498	Switzerland
GridShare	Hybrid (Lending, Equity, Reward)	Returns vary: % of the revenue or profit generated by the projects (Lending), dividends (Equity) or rewards provided (Reward)	14	54,874	USA

NON FINANCIAL PLATFORMS					
Platform	Model	Investor's benefit	Number of projects	Money raised (€)	Country
Solar Schools	Donation	No monetary returns for investors. Money collected are used by a charity to install photovoltaic plants on UK schools	65	691,976	United Kingdom
Re-Volv	Donation (plus Revolving Fund)	No monetary returns for investors. The lease payments are reinvested in a revolving fund, the Solar Seed Fund, to further finance community-based solar projects	3	106,448	USA
Divvy	Donation/Reward	No monetary returns. Rewards provided	4	10,423	USA
Clean Reach	Donation	No monetary returns for investors. Money collected are used for testing new technologies and organize thematic events	6	5,698	USA
Milaap	Lending (for social value projects)	Loan without interests or repayment - high social value project	15	338	India