



Building the investment community for innovative energy technology projects

Task 1: Improving the investment community to
facilitate increased investments

Final report

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Presented by

Consortium led by:

Trinomics B.V.

Westersingel 32A

3014 GS, Rotterdam

the Netherlands

Contact main author(s)

Mr. Onne Hoogland

E: Onne.hoogland@trinomics.eu

T: +31 (0)6 1036 0790

Date

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Service contract regarding a study on “Building the Investment Community for innovative energy technology projects”

Onne Hoogland (Trinomics)
Alexander Schmidt (Trinomics)
Koen Rademaekers (Trinomics)
Annica Cochu (adelphi)
Johannes Alexeew (adelphi)

In association with:



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Executive Summary

Objectives of the study

This report, titled ‘Improving the investment community to facilitate increased investments’, constitutes deliverable D1 of the study on ‘Building the investment community for innovative energy technology projects’ (Ref N°ENER/C2/2016-500) and is carried out for the European Commission, DG Energy. The overall objective of the study is to contribute to *‘increasing the volume of investment in innovative energy technologies and help achieving the EU’s 2030 climate and energy targets’*. This task report contributes to this objective by providing an understanding of the current European investment community for clean energy innovations. Furthermore, it defines and scopes the investment community, identifies and analyses the main reasons for the lack of investment, and outlines best practices and potential complementary services to facilitate increased investments.

Background

Innovation plays a key role in European energy policy because it can contribute to reaching the primary energy goals: security of supply, sustainability, and competitiveness. Hence, the public sector supports innovation through various means such as research funding. Thanks to this support, innovations can progress from early research to working prototypes. Once innovations reach the stage of a working prototype it becomes increasingly difficult for the innovator to secure financing for further development. Public support is generally not sufficient anymore due to increasingly high capital requirements for developing the technology. Private funding is also hard to access at this stage due to the high risks, low returns and long development cycles that are typically associated with immature energy technology innovations. As a result, a high number of innovators have to cease their activities at this stage and potentially important innovations never reach the market. This phenomenon is also known as the ‘valley of death’ and is the core issue that this study aims to address.

Understanding the investment community

This study takes the angle of understanding and improving the ‘investment community’ for realising the overarching objectives. We define the investment community for innovative clean energy technologies as *‘the group of people who can play a role in increasing the volume invested in these technologies in Europe’* and identify innovators, investors and matching platforms as the key players of this community.

Innovators

The innovators in scope of this study fulfil the following criteria:

1. **Technology:** Renewable energy sources (solar, wind, etc.) or energy smart technologies (energy efficiency, storage, etc.);
2. **Type of innovation:** Technology driven. Both process and product innovations;
3. **Maturity:** Prototype available and successfully demonstrated. Not on the market yet. Technology readiness levels 7, 8 and 9.

The European landscape of innovators that fulfil those criteria encompasses a broad variety of technologies with substantial innovation activity. The innovators are generally located in the Western parts of Europe, with especially high activity in Spain, Germany, Italy, the UK and the Netherlands. Their next investment round is generally for financing a commercial scale manufacturing facility or for

deploying a commercial scale energy generating facility. The typical amount of money that is required ranges from EUR 3 to 80 million.

Investors

The most appropriate investors for the innovators in scope are venture capital funds and corporate investors. These investors are able to provide the right amount of capital and have a sufficiently high risk appetite to invest in innovative energy ventures. Angel investors, crowdfunding and family offices are also appropriate investor types for the innovators in scope. Accelerators, incubators, growth/expansion capital funds, commercial banks and institutional investors are generally not appropriate due to a mismatch with their requirements in terms of the maturity of the venture and the amount of capital that is required. Hence, these investors are not considered an important part of the investment community for clean energy innovations.

Venture capital funding in Europe is generally very low compared to the US and several European venture capital funds have moved away from the cleantech sector. Still, several specialised cleantech venture capital funds are present in the countries with most innovation activity such as Germany and the UK. The relevant **corporate investors** comprise of utilities, oil & gas companies and manufacturing conglomerates such as Siemens and ABB. Some have a dedicated corporate venture capital arm for investing in innovative energy ventures, while others take a more pragmatic approach and invest directly from their balance sheet when an opportunity arises. The European landscape of **angel investors** and **family offices** is less transparent because they generally do not publicly advertise their services. Still, investment volumes from business angels are estimated to be significant. **Crowdfunding** only play a minor role in the total investor landscape. In several countries further growth is hindered by the legal framework.

Matching platforms

The final group of key players in the investment community consists of matching platforms. They could play a role in facilitating contacts between innovators and investors and may be used as a tool for policy makers to contribute to the investment community's functioning. Matching services are offered by a variety of parties such as accelerators, crowdfunding platforms, match-making events, online matching services and fundraising advisors.

Especially **match-making events** and **online matching services** are relevant for the scope of this study. These service providers target innovators at the right level of maturity and provide a formalised structure that can be studied, learned from and improved upon. Relevant match-making events include Ecosummit, the Business Booster and Cleantech Forum. Examples of relevant online matching services are Angelist, the European Investment Project Portal (EIPP), and Innosix.

Reasons for not investing

Clean energy innovators face several issues when trying to raise capital for their ventures. To a certain extent, this can be regarded as a healthy process of selecting the most promising innovations for continued development and discontinuing the work on innovations that are not feasible or desirable. But part of the reasons for failure to attract investments are not necessarily linked to the feasibility or desirability of the innovation. Instead, they result from several issues that obstruct investments in the sector.

Some of these issues originate from fundamental properties of the sector (intrinsic issues). Examples include too high technological, regulatory and commercial risk, too small venture capital funds and the lengthy time horizon for commercialising clean energy innovations. We conclude that these issues cannot be resolved by efforts to improve the functioning of the European investment community such as match-making, training and coaching. Instead, stronger interventions are required such as carbon taxes, public funding or regulation to ban competing (fossil fuel) technologies.

Meanwhile, several important issues exist that are transactional in nature, such as the innovator's lack of financial knowledge, the lack of a properly developed business plan and the investor's lack of technical knowledge. Furthermore, innovators tend to lack commercial and communicative skills and a network with the financial sector which is especially crucial for identifying business angels and family offices. We posit that these issues can be targeted by efforts to improve the European investment community because these issues do not stem from fundamental mismatches between investor preferences and the innovative venture's characteristics. Especially matching platforms would be well-positioned to contribute to overcoming these issues as they specialise in liaising between innovators and investors.

Facilitating increased investments

The efforts that matching platforms could take to overcome the transactional issues can be sub-divided into complementary services that directly address transactional issues and best practices to improve the existing match-making activities.

We conclude that especially InnoEnergy already provides most of the complementary services that are required to overcome these issues, such as financial advisory, technology due diligence and training on soft skills. But also platforms such as Ecosummit, Slush and the High-Tech Venture Days offer some services that target pressing issues.

Best practices for effectively facilitating investments in the sector are not always applied consistently, as several platforms set their agenda, geographical and technical scope too broad. Tech Tour can be seen as the platform that applies the best practices most consistently as they invite a diverse set of investors, organise small, regional events and focus their events on a specific technology.

Overall, we conclude that the European investment community for innovative clean energy technologies can be improved by efforts to build a better functioning community. Existing initiatives like InnoEnergy could be further developed to meet unmet needs such as regional, technology-specific events that offer the most relevant complementary services *and* apply a focused agenda. Alternatively, new match-making initiatives could be launched for the technologies and regions that are most active, hereby providing a rapid, targeted stimulus to investments in these sectors.

1 Introduction

This report, titled ‘Improving the investment community to facilitate increased investments’, constitutes deliverable D1 of the study on ‘Building the investment community for innovative energy technology projects’ (Ref N°ENER/C2/2016-500), carried out for the European Commission, DG Energy. In this chapter, we outline the background and objectives of the study and provide a reading guide for this report.

1.1 Background

1.1.1 Public sector support for energy innovation

EU energy policy has historically been driven by goals on security of supply, sustainability and competitiveness/affordability. The current Energy Union strategy also reflects these objectives by including dimensions targeting energy security, decarbonisation and competitiveness (as part of the research, innovation and competitiveness dimension).¹ Research, Development and Innovation (RD&I) is key for reaching those goals as it contributes to making renewable energy technologies competitive with conventional energy sources, hereby reducing the costs for decarbonisation and increasing the options for securing an affordable energy supply. Furthermore, world-class RD&I is key for realising the EU’s ambition to become the global leader in renewables.²

In line with this high importance of RD&I on energy technologies, the EU Framework Programme for Research and Technological Development (Horizon 2020) provides funding for research on low carbon technologies (EUR 1.1 billion/year). Together with Member State funding (EUR 4.2 billion/year) this translates to total public funding for research on low-carbon technologies of more than EUR 5 billion/year (in 2014).³ Thanks to this support, innovative low-carbon technologies can progress from early research to working prototypes.

1.1.2 The valley of death

Once innovations are developed to the stage of a working prototype they reach the so-called ‘valley of death’, which is used to describe the high failure rate of innovative firms in the stage prior to commercialisation.⁴ At this stage, the technology is not yet mature enough to be commercialised and may still need years of development before the first revenues can be generated. Meanwhile, the capital requirements for development are increasing as demonstration in a real-life environment and at a larger scale are needed to prove the technical feasibility of the innovation. A recent study for the Commission suggests investment needs ranging from EUR 4 billion to EUR 28.5 billion until 2020 for first-of-a-kind, commercial-scale demonstration projects in Europe and estimates that these investments can only be provided for a small part (EUR 4 billion) by the existing public support schemes such as NER 300 and MS instruments.⁵ Hence, private sector investments and/or additional public support are required to bring more energy innovations to the market.

¹ COM(2015) 80 final - Energy Union Package

² COM(2016) 763 final - Accelerating Clean Energy Innovation

³ EC(2016) - Transforming the European Energy System through Innovation - Integrated SET Plan Progress in 2016

⁴ BNEF (2016) - finance guide for policy makers

⁵ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

Attracting capital from private sector investors turns out to be difficult for a variety of reasons. Some of these reasons relate to intrinsic properties of the clean energy sector, such as high risks, low returns and long development cycles that deter investors.⁶ Other reasons are more transactional in nature and relate to issues in finding the right investors, preparing well for investment rounds and bringing the technical features clearly across to the investors. Together, these issues lead to a lack of private sector investment which results in failures to commercialise innovations.

1.1.3 Policies targeting the valley of death

Several EU policies focus on bridging the valley of death. Relevant policy initiatives include:

- InnovFin Energy Demo Projects which provides loans or loan guarantees to first-of-a-kind commercial scale demonstration projects in the fields of renewable energy and hydrogen and fuel cells⁷;
- InnoEnergy and Climate-KIC, the European Institute of Innovation and Technology's (EIT) energy and climate knowledge and innovation communities, which play a key role in generating a pipeline of innovative energy projects for investors and also increasingly provide advisory services to innovators⁸;
- The proposed creation of an Innovation Fund as a successor to the current NER 300 facility. This fund should support highly-innovative low-carbon technologies⁹
- The Start-up and Scale-up Initiative (2016), which includes several actions to improve access to finance for European start-ups, such as the creation of a pan-European Venture Capital Fund of Funds and a platform to share best practices on crowdfunding¹⁰;
- The European Investment Project Portal (EIPP) which provides a free platform to link investment opportunities and investors¹¹.

Moreover, the recent Winter Package (2016) includes a wide range of proposals to strengthen existing efforts and add new ones. Examples include the proposal to double the budget of the InnovFin Energy Demonstration Projects scheme, to expand its scope and to create a one-stop advisory facility to guide potential investors and developers through the different instruments available. Furthermore, a pipeline of innovative projects will be brought to the attention of investors.¹² The Winter Package also includes a wide range of proposals to tackle intrinsic issues that prohibit investments in clean energy innovation. These proposals either directly stimulate the uptake of clean energy technologies or weaken the business case for competing fossil fuels by effective carbon pricing and eliminating fossil fuel subsidies.¹³

1.2 Objectives

The overall objective of this study is to contribute to '*increasing the volume of investment in innovative energy technologies and help achieving the EU's 2030 climate and energy targets*'. In order to meet this objective, it is essential for the community of innovators, investors and other stakeholders to work effectively together. This community - i.e. the *investment community* - is the focus of this

⁶ Gaddy et al. (2016) - Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation

⁷ <http://www.eib.org/products/blending/innovfin/products/energy-demo-projects.htm>

⁸ COM(2016) 763 final - Accelerating Clean Energy Innovation

⁹ COM(2016) 763 final - Accelerating Clean Energy Innovation

¹⁰ COM(2016) 733 final - Europe's next leaders: the Start-up and Scale-up Initiative

¹¹ <https://ec.europa.eu/eipp/desktop/en/index.html>

¹² COM(2016) 763 final - Accelerating Clean Energy Innovation

¹³ COM(2016) 860 final Annex 2 - Clean Energy For All Europeans: Action to boost the clean energy transition

study. The study's tasks comprise of activities to better understand the functioning of this investment community as well as activities to concretely improve the functioning of the investment community.

The five tasks of this study can be summarised as:

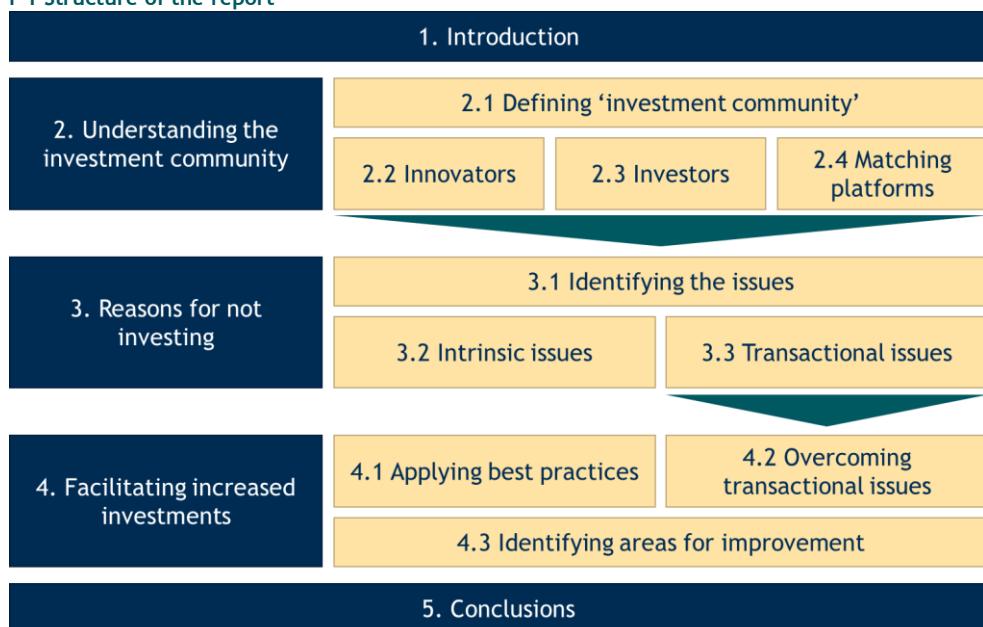
- **Task 1** (this report) provides an understanding of the current European investment community for clean energy innovations. Definitions and scoping of the investment community are provided, issues are assessed, and best practices are identified that may help to overcome the issues.
- **Task 2** aims to identify 40 to 50 innovative and investable clean energy projects. These projects are bundled into a portfolio that outlines the innovation, financials, company structure, target markets, regulatory issues, risks and financing options of the project. This portfolio is used to attract investors to the match-making events that are organised as part of this study (task 4).
- **Task 3** is to deliver a guide (or vademecum) for innovators on how to succeed in securing a sustainable stream of finance throughout the different phases of project development. This vademecum will be made available to innovators across Europe in order to improve their skills in raising capital.
- **Task 4** is to organise a series of match-making events to establish fruitful contacts between innovators and investors, with the ultimate aim to facilitate investments in the sector. These events will be supported by a communication strategy, website and other communication tools to attract the right audience to the events and disseminate the project's outputs.
- **Task 5** collates the findings of all tasks and provides an in-depth assessment of the existing policy measures. Based on these, recommendations will be drafted for EU policy makers.

This report constitutes the final output of task 1.

1.3 Reading guide

This report is structured into five chapters as illustrated in Figure 1-1.

Figure 1-1 Structure of the report



After the introduction (chapter 1) we proceed to create a proper understanding of the European investment community for clean energy technology projects in chapter 2. We do this by drafting a definition of the concept of an ‘Investment community’ and by defining and scoping the key players: Innovators, Investors and Matching platforms. For each key player, we assess the EU landscape to provide insight into the characteristics and geographical distribution of the players that are active in the community.

In chapter 3, we first identify the main issues that obstruct investments in clean energy innovations. We sub-divide these issues in intrinsic issues (e.g. regulatory risks) and transactional issues (e.g. targeting the wrong investors). Subsequently, we analyse the main intrinsic and transactional issues to create a deeper understanding of the root causes.

In chapter 4, we identify ways to facilitate increased investments in the sector within the realm of investment community building. As investment community building efforts (e.g. match-making) are not suitable to address intrinsic issues, we focus on overcoming the transactional issues. Additionally, we identify best practices that can be applied to investment community building efforts and compare the best practices and potential ways to overcome transactional issues to the current offerings of matching platforms to identify gaps in the existing landscape.

In chapter 5, we draw overall conclusions on the European investment community for innovative energy technology projects.

Annex 1 provides the following case studies on innovative energy ventures and matching platforms:

1. Aurelia Turbines (innovator)
2. Enervalis (innovator)
3. Skeleton Technologies (innovator)
4. Smart Hydro Power (innovator)
5. European Investment Advisory Hub (matching platform)
6. ETEQ Venture (matching platform)
7. Greencrowd (matching platform / equity crowdfunding)
8. InnoEnergy (matching platform / accelerator)

These case studies are used as input to the analyses in the main report and provide detailed accounts of the experiences of relevant actors in the European investment community. These case studies provide valuable detail on ways to improve the investment community as well as insightful real-life experiences.

Annex 2 provides a list of stakeholders that have been interviewed for this study.

2 Understanding the investment community

Before getting into a discussion on the possibilities to strengthen the investment community for innovative energy technology projects, it is important to provide a clear definition of the concept of an ‘investment community’. Furthermore, the key players that are active in the community need to be properly understood to fully grasp the scope of the topic and its challenges. In this chapter, we will provide this understanding.

2.1 Defining ‘investment community’

The concept of an investment community is not consistently defined in the literature. In fact, there is little literature at all on this specific concept. Hence, we need to define the concept before moving on to further discussions on how to build such a community.

Our starting point for developing a fit-for-purpose definition of an ‘investment community’ is the overall objective of this study, which is to *‘increase the volume of investment in innovative clean energy technologies’*. If we take into account the definition of a community (i.e. a group of people having a particular characteristic in common), we can construct the following definition of the investment community:

The investment community for innovative clean energy technologies is the group of people who can play a role in increasing the volume invested in these technologies in Europe.

While a broad range of actors may contribute in some way to increasing the investment volume, we distinguish three types of actors of particular relevance:

1. Innovators: The recipients of the investments and the party responsible for preparing a business plan that is worth investing in;
2. Investors: The suppliers of the capital and the party responsible for the final decision on a potential investment;
3. Matching platforms: The potential catalysts for increasing the volume of investment by overcoming issues that prevent innovators and investors from finding each other and working together successfully.

Together, these actors are the key players to overcome the issues that prevent investments in innovative clean energy technologies from happening (as discussed in chapter 3). In the next sections, we discuss each group in detail. It should be noted that we do not discuss policy makers as a key player in this report yet. Their role and concrete recommendations for policy measures are discussed in a separate report (task 5).

2.2 Key players: Innovators

2.2.1 Scope and definitions

To identify the innovators of relevance to this study, it is important to clearly define what is meant by ‘innovative clean energy technologies’. In this section, we outline the technologies, type of innovations and maturity levels that are in scope.

Clean energy technologies

The scope of technologies for this study consists of the (potential) pillars of a future clean energy system, which include:

- Renewable energy sources (RES): including solar, wind, bio, hydro, ocean and geothermal energy as well as any novel renewable energy sources.
- Energy smart technologies: including energy efficiency, storage, electrified transport, fuel cells, hydrogen, carbon capture and storage/utilisation (CCSU), (smart) grids and various ICT applications that contribute to an increased digitalisation of the energy system.

It should be noted that even though some of the above technologies are more mature than others, innovations occur in all of them. Hence, technologies like solar PV and onshore wind are also included in the scope of this study.

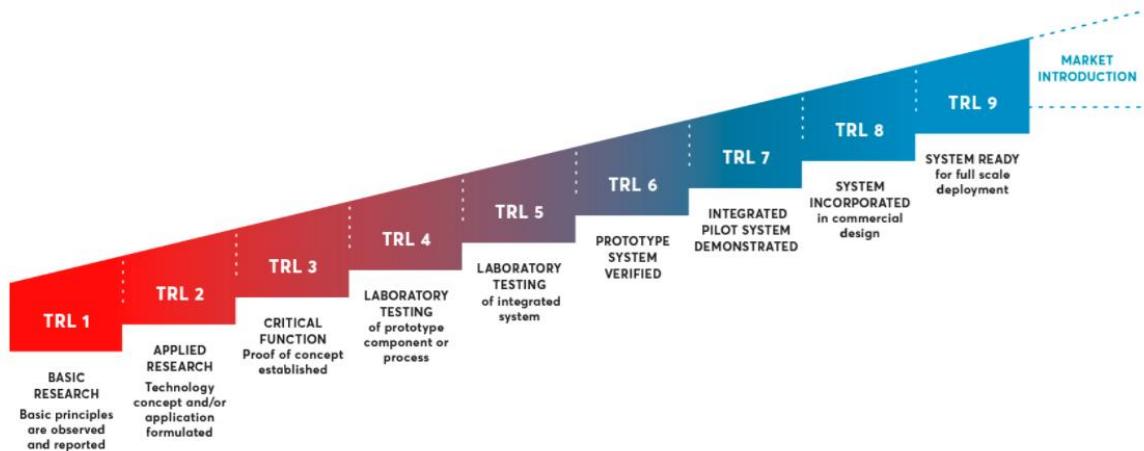
Type of innovations

The type of innovations that we treat in this study should be of a technological nature, so that social or business model innovations will not be included. Both product and process technological innovations are included. The former is for example making an existing product more efficient, such as increasing the efficiency of wind turbines, while process innovations make the manufacturing of said product more efficient.

Maturity

In terms of maturity, the upper boundary of this study is that the technology must currently be non-commercialised, i.e. it must not be on the market. Within non-commercialised projects, the technology readiness levels (TRLs) are often used to define the maturity of a specific project.¹⁴

Figure 2-1 The technology readiness level scale



Source: http://brigaid.eu/new_technical-readiness/

The lower boundary to the maturity of a project is that it needs to be sufficiently mature to attract private financing. While this can differ from case to case, attracting significant private funding generally becomes feasible from TRL 7 onwards. Hence, the scope of projects included for this study in terms of maturity consists of TRL 7, 8 and 9.

¹⁴ See for instance the General Annexes of the Horizon 2020 Work Programme 2016-2017, section G, available at: http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016-2017/annexes/h2020-wp1617-annex-ga_en.pdf

2.2.2 EU landscape

Now that the scope boundaries are defined, we can move on to an assessment of the current EU landscape of innovators that are of interest for this study. This identification will provide a better understanding of the quantity and characteristics of the innovators that require investments, which will be used in the latter chapters of this report and will feed into the organisation of match-making events that is a part of this study (Task 4). Such match-making events would be most effective if they target the regions and technologies with the highest concentration of innovators that require funding.

In order to provide an indicative picture of the innovation activity across Europe we use the Cordis database as the primary source of information. This database contains the projects funded through the most recent EU research and innovation funding programmes (FP7 and Horizon 2020).¹⁵ We identified the projects of interest by applying filters for maturity (TRL level), innovativeness, sector (only clean energy technologies) and whether the project was investable.¹⁶ This led to a selection of 180 projects for which an assessment has been done in terms of technology and geographical distribution.

Technologies

Table 2-1 provides an overview of the number of projects per technology which have been filtered from the Cordis database. This overview reveals that a wide range of RES and energy smart technologies are developed in the EU. In terms of renewable energy sources, the main technologies are solar (PV, CSP and some others), wind, bio-energy (biogas, biomass, waste heat, biofuel) and tidal power. For energy smart technologies, there is significant activity on energy savings, distribution systems, smart cities and industry.

Table 2-1 Number of EU-funded innovative clean energy technology projects per technology

Technology	# of projects
Solar (PV)	20
Energy Savings	19
Wind	18
Distribution System	17
Biogas/Biomass/Waste heat	12
Smart Cities	12
Industry	12
Biofuel	10
Carbon Capture and Storage (CCS)	10
Solar (CSP)	10
Tidal	9
Storage	5
Solar (Other, e.g. heating, cooling)	3
Geothermal	2
Wave	0
Other	19
Total	180

Source: Accompanying note on portfolio of innovative energy projects, delivered as part of task 2 of this study.

¹⁵ By using an EU-wide source we avoid skewing the data towards specific technologies or countries for which it is easier to identify relevant projects. Still, the data may not be fully representative of the innovation activities across Europe as innovators in some countries may be better equipped to successfully bid for EU funding than others.

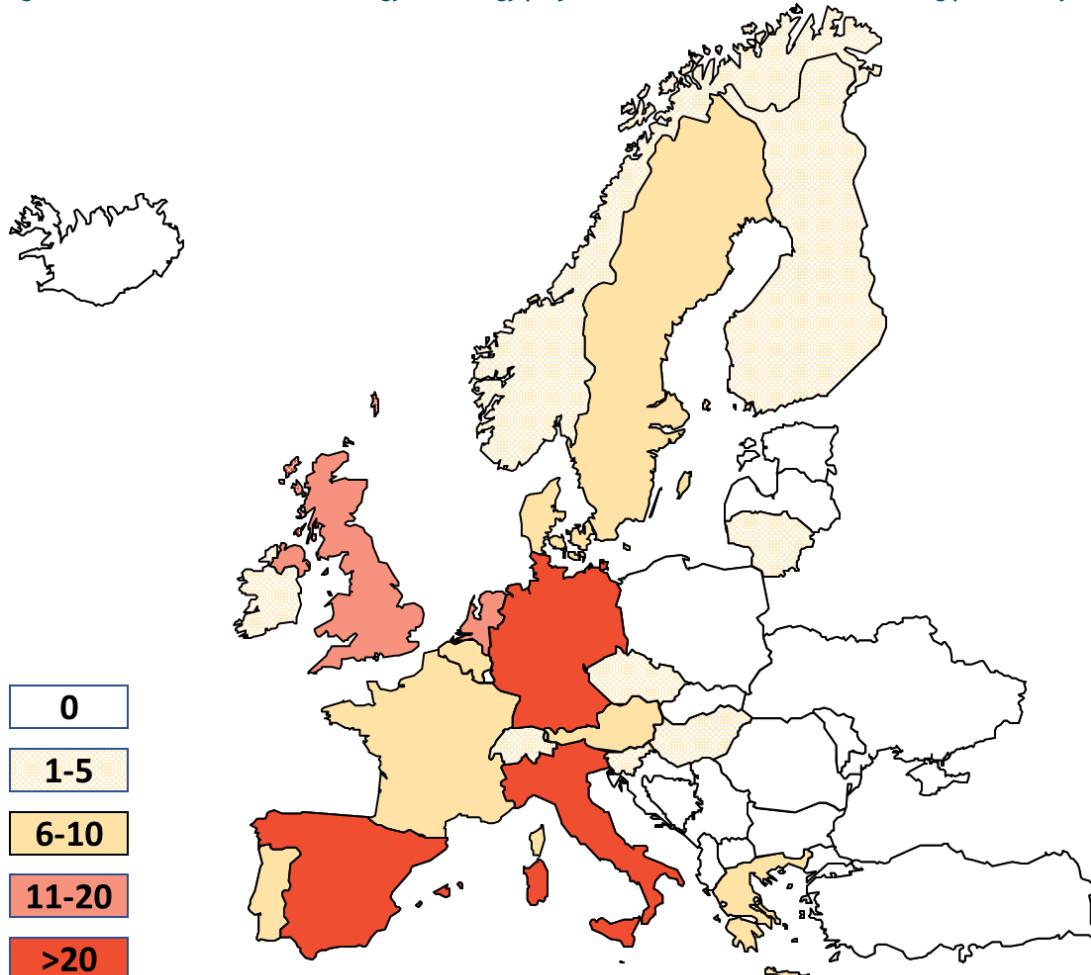
¹⁶ See accompanying note of the project portfolio for more details on the filtering (task 2 of this study).

NB: Other includes heat pumps, microalgae, TSO, CHP, polygeneration, solid waste recycling, non-RES generation, sewage sludge, leaks detection and power actuators.

Geographical distribution

Figure 2-1Figure 2-2 provides an overview of the geographical distribution of the 180 EU funded innovative energy technology projects that we identified in the Cordis database. This overview indicates that most innovation activity takes place in Western Europe, with especially Germany, Spain and Italy having a relatively high number of innovative energy technology projects. Furthermore, the UK and the Netherlands are relatively active in this field.

Figure 2-2 Number of innovative energy technology projects that received H2020/FP7 funding per country¹⁷



Source: Accompanying note on portfolio of innovative energy projects, delivered as part of task 2 of this study.

It should be noted that this overview of projects per country only includes EU-funded research projects, which provides a cleaner picture of the geographical distribution than when including projects identified via other modes. For instance, the ocean energy association had been very helpful in providing information on innovative projects. Incorporating this data would however skew the statistics towards coastal countries and ocean energy technologies, which would not be representative for the situation across Europe. So, overall, Figure 2-2 gives an indication of where most activity takes place

¹⁷ Including associated countries http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

but does not indicate the total clean energy innovation activity which is much higher because only a fraction of the projects is successful at raising EU funding.

Capital requirements

Another relevant dimension to properly understand the clean energy innovators is the amount of capital that they typically require at the stage of interest (i.e. at TRL 7-9). This would partly determine which investor types are relevant for boosting the investment volumes. European venture capital funds, for instance, typically invest up to 5 million Euro in cleantech ventures, whereas banks generally do not consider investments below 20 million Euro.¹⁸

The capital requirements of clean energy innovators have been assessed in a recent study for the European Commission on first-of-a-kind commercial-scale demonstration projects in the energy sector.¹⁹ The findings of this study concerning capital requirements can be summarised as:

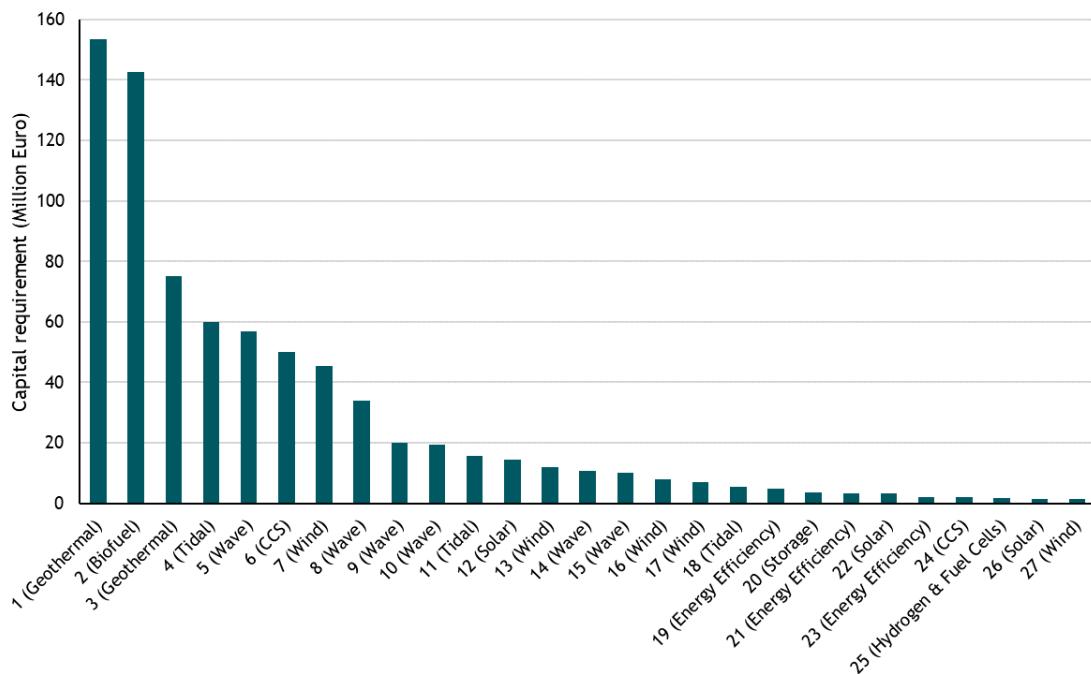
- The majority of projects (85%) require an investment below EUR 75 million. 12% of projects fall in the range of EUR 75 - 375 million and 4% exceed EUR 375M;
- The capital requirements show a large spread. Even within the same technology volumes range from tens to hundreds of millions;
- Carbon Capture and Storage (CCS) projects are extremely expensive with capital requirements ranging from EUR 500 - 1400 million.

The project portfolio assembled as part of this study provides supplementary information on the capital requirements for innovative energy technology ventures. Figure 2-3 displays the capital requirements for the next investment round of the ventures that participated. The next investment round generally concerns the investment for building a manufacturing facility to start producing the technology at a commercial scale or, alternatively, the investment for deploying a commercial scale energy generating facility. In a few cases, these capital requirements concern the investment figures for realising a demonstration project.

¹⁸ See section on ‘investors’ for a detailed discussion on the preferences of the different investor types.

¹⁹ ICF and London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind, commercial-scale demonstration projects in the field of energy.

Figure 2-3 Capital requirements for the next investment round (generally for commercialisation) of the projects in the portfolio



Source: Own elaboration based on project data collected for task 2 of this study (D2: Project portfolio).

Note: Capital requirements differ from summary statistics in the project portfolio because they include the full capital requirement in this report and only the remaining, unsecured capital in the summary statistics in the portfolio.

The capital requirements for the 27 projects that have been studied in detail²⁰ reveal that the majority of the projects (19 out of 27) require an investment of less than EUR 20 million. Of the remainder, 6 projects require an investment between EUR 20 and 80 million and 2 projects require an investment of more than EUR 80 million. This is consistent with the findings from the recent study on first-of-a-kind energy projects presented earlier in that the vast majority of projects requires an investment volume below EUR 75 / 80 million. What differs, however, is the large number of projects with capital requirements of only a few million, which was not the case in the other study.

Overall, we conclude that the typical investment volumes that clean energy innovators require range from EUR 3 to 80 million and that a properly functioning investment community should be able to deliver such investment volumes consistently.

²⁰ These projects have been identified based on a variety of sources, including but not limited to the CORDIS database. 27 project developers (i.e. innovators) were willing to provide detailed information which has been included in the project portfolio that has been delivered as a separate deliverable of this study. Due to confidentiality issues the portfolio is not publicly available.

2.3 Key players: Investors

2.3.1 Scope and definitions

The second set of key players of the investment community are the investors who would provide capital to the innovators outlined in the previous section. A broad set of investor types could be considered for this purpose. Table 2-2 provides an overview of potentially relevant investor types from the private sector.

Table 2-2 Private sector investor types

Investor type	Description
Own resources, family & friends	Friends, family and founders who invest their personal capital.
Accelerators & incubators	Structures that invest a small amount of money in a large number of start-ups.
Angel investors	Affluent individuals that provide capital and know-how to start-ups.
Equity crowdfunding	Large numbers of individuals who generally provide small amounts of capital each, via a crowdfunding platform.
Venture capital fund	A type of private equity fund that provides capital to small, early stage, emerging firms with high-growth potential.
Family offices	Entities that manage the investments of wealthy families.
Growth/expansion capital fund	A type of private equity fund that provides capital to fund the expansion of an established firm.
Corporate investor	Large companies that invest in other firms, either directly or via a corporate venture capital fund.
Commercial bank ²¹	Private commercial banks such as Deutsche Bank and BNP Paribas Fortis.
Institutional investor	A non-bank organisation that invests large amounts, such as pension funds and insurance companies.

Source: Compiled on the basis of expert inputs and various sources, including AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses, ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind, commercial-scale demonstration projects in the field of Energy, BNEF (2016) - Finance Guide for Policy-Makers: Renewable energy, green infrastructure.

While all these investor types may be relevant for the innovator at some stage of maturity, not all of them invest in the technology readiness levels of interest for this study (TRL 7-9) and are able to provide the required sums of capital. Both our literature review and case studies point to a common sequence of investor types throughout the development of the venture, starting with own resources, family and friends followed by accelerators & incubators and angel investors. Afterwards, venture capital funds, crowdfunding, family offices and corporate investors start to invest. Only at a later stage, growth/expansion capital funds, commercial banks and institutional investors get involved.

The prevalence of certain investor types at specific stages of the development of the venture can be explained for a large part by the investment preferences of the investors in terms of maturity and investment volume. Implicit to the investment preferences in terms of maturity is that investments in less mature ventures generally carry a higher risk. Preferences for less mature ventures are therefore synonymous with a higher risk appetite. Table 2-3 summarises the findings from our literature review on

²¹ As commercial banks generally do not make equity investments but provide debt financing, they are not real 'investors'. Still, we include them in this assessment as banks are often one of the sources of finance considered when innovators require finance.

those preferences and indicates to what extent these match with the requirements of the innovators in scope (i.e. maturity: TRL 7-9, Amount: EUR 3 - 80 million).

Table 2-3 Investment preferences per investor type (generalised, for Europe-based investors)

Investor type	Typical maturity of venture	Typical amount per transaction	Main sources
Own resources, family & friends	TRL <7	€20 - 100K	AFME (2017)
Accelerators & incubators	TRL < 7	€10 - 150K	AFME (2017)
Angel investors	TRL 7-9	€50K - 1M	AFME (2017)
Crowdfunding	All stages	€20K - 5M	AFME (2017)
Venture capital fund	TRL 7-9	€300K - 5M	AFME (2017), EC (2015), interviews
Family offices	All stages	€500K - 10M	BNEF (2016), interviews
Growth/expansion capital fund	Commercial	€5M - 100M	EC (2015)
Corporate investor	TRL 7-9	€20m - €100M	ICF & LE (2016)
Commercial bank	Commercial	€20m - €100M	ICF & LE (2016)
Institutional investor	Commercial	> €25M	EC (2015)

Legend: Green: Preferences match innovator requirements; Yellow: Preference partly match innovator requirements; Red: Preferences do not match innovator requirements.

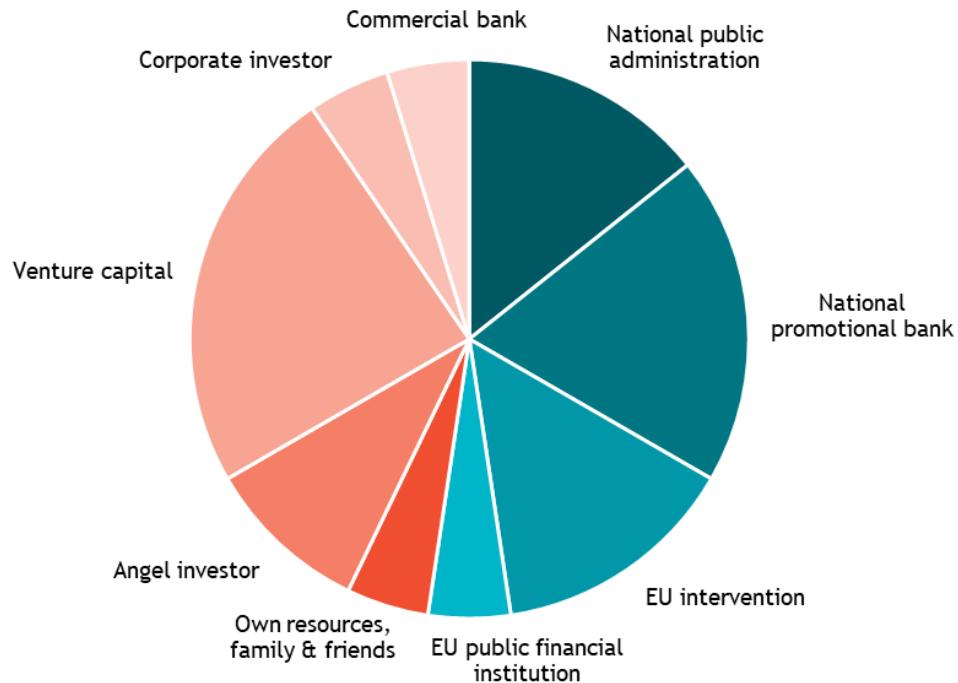
Source: Own elaboration compiled on the basis of expert interviews (see Annex 2) and various sources, including AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses, ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind, commercial-scale demonstration projects in the field of Energy, EC (2015) - Assessing the Potential for EU Investment in Venture Capital and Other Risk Capital Fund of Funds, BNEF (2016) - Finance Guide for Policy-Makers: Renewable energy, green infrastructure.

The above analysis shows that the investor types ‘own resources, family and friends’ and ‘accelerators and incubators’ typically invest in ventures that are less mature and require less capital than the innovators in scope of this study. Angel investors do tend to invest in the right maturity levels but typically invest amounts lower than those required at this stage. They may still be relevant however, if their funding can be combined with funds from other sources. Crowdfunding may be applicable on both criteria as well as venture capital funds, family offices and corporate investors. Growth/expansion capital funds, commercial banks and institutional investors would typically not invest in innovative energy ventures because the maturity of the venture is generally too low for their risk appetite. Overall, we conclude that especially venture capital funds and corporate investors appear to be suitable investor types for innovative energy technology ventures. Crowdfunding, angel investors and family offices would be other sources of potential relevance.

It should be noted that investors generally do not invest as a single investor but syndicate their investments (i.e. invest together with other investors). Hence, transaction volume preferences on the low end of the capital requirements can be less of an issue in practice, because the total group of investors would be able to bring a larger sum of capital together. There are limitations to this approach, however, as a too large syndicate of investors would bring too much complexity. Furthermore, it should be stressed that these generalised preferences provide a theoretical indication of the most relevant investors types but that the experiences in practice should be assessed to confirm their willingness to invest in real life, which we will discuss next.

The case studies (see annex) provide detailed insight into the investment history of four innovative energy technology ventures in practice. Figure 2-5 provides an overview of the number of investments made per investor type from TRL 7 to 9.

Figure 2-4 Share of total number of investments made at TRL's 7 to 9 in the case studies



Source: Own elaboration based on case studies annexed to this report.

Note: The size of the parts indicates the share of the total number of investments. For instance, 5 venture capital investments were identified in the case studies out of a total 21 investments at this stage, which results in a share of 5/21=24% of the pie. The size of the investment is not accounted for. Hence, the picture merely illustrates which investor types are active, not how much money they contribute.

This analysis confirms the suitability of venture capital funds for investing in this stage of maturity. Corporate investors are less well presented in the case studies though. A further insight is that angel investors appear to be relatively active in this stage, which signals that their limited investment amounts do not exclude them from investing at this stage. As noted earlier, combining the angel investment with other investments may still add up to an investment that is large enough. The presence of a commercial bank as an investor in one of the ventures is somewhat surprising though, as the lack of maturity would normally deter banks from investing. Finally, public investor types such as national promotional banks and EU interventions still play an important role at this stage, which is also confirmed in the literature.²²

2.3.2 EU landscape

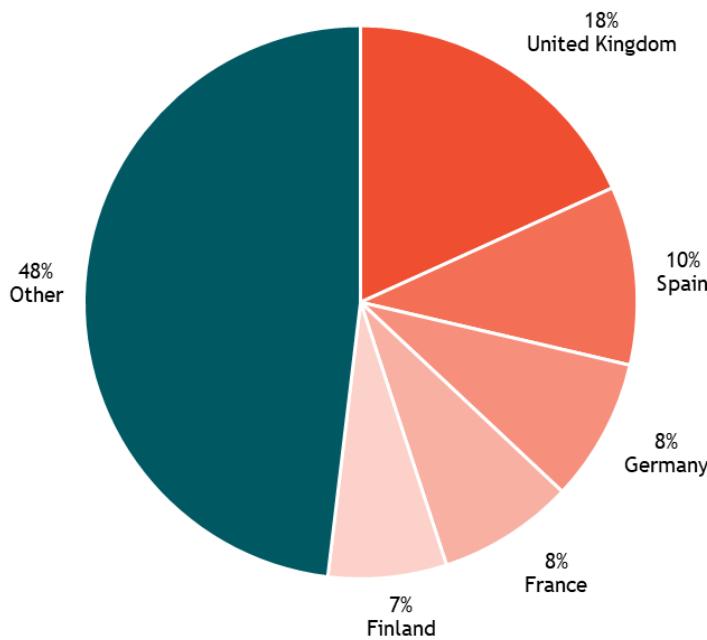
As indicated in the previous section, the investors of relevance for the investment community of interest to this study comprise angel investors, equity crowdfunding, venture capital funds, family offices and corporate investors. In this section, we will provide insight into the characteristics of these investor types within the EU, based on a literature review, web search and expert interviews.

²² ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind, commercial-scale demonstration projects in the field of Energy

Angel investors

The volume of EU angel investments in early stage ventures is estimated to be approximately EUR 6 billion per year (in 2015), provided by 300.000 individual angel investors.²³ The countries with the highest volumes of angel investment are the United Kingdom, Spain and Germany (see Figure 2-6), whereas Estonia, Finland and Portugal have the highest angel investment volumes relative to the size of the economy (i.e. relative to their GDP).²⁴

Figure 2-5 Country shares of total business angel investments in Europe (2015)



Source: Own elaboration based on data from EBAN (2016) - European Early Stage Market Statistics.

Note: 'Other' also includes non-EU28 countries such as Russia and Turkey.

The main sector of angel investments is ICT (22% of investment volume) with energy accounting for only 2% of the EU angel investment volume.²⁵ These figures are only a rough estimate though, as angel investments are typically not publicly known and angel investors do not publicly advertise their services.

There are numerous business angel networks in the EU which serve as networking platforms among angel investors and frequently also channel investment opportunities to potentially interested angel investors. A highly relevant initiative is the recently (June 2017) announced partnership between InnoEnergy (Europe's largest sustainable energy accelerator) and EBAN (the European trade association for business angels). Via this partnership, called EBAN energy, those organisations intend to collaborate to drive more sustainable energy innovations to the market.²⁶

At Member State level, business angel networks exist in all European countries.^{27,28} In smaller countries such as Portugal²⁹ and Belgium³⁰, investment proposals can be submitted directly to those networks who

²³ AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

²⁴ EBAN (2016) - European Early Stage Market Statistics

²⁵ EBAN (2016) - European Early Stage Market Statistics

²⁶ <http://www.innoenergy.com/innoenergy-and-eban-unveil-eban-energy-to-drive-more-sustainable-energy-innovations-to-market/>

²⁷ EBAN (2016) - European Early Stage Market Statistics

²⁸ A list of the networks is available in the vademecum for energy innovators which is delivered as part of this study.

²⁹ <http://www.apba.pt/find-investors/>

liaise with their Members to find potentially interested angel investors. In larger countries such as Spain³¹ and Germany³², country-wide networks generally do not liaise between innovators and investors directly but link to regional networks that take this role. Also, some cross-country networks exist³³ but most angel investments (94%) are still done within the same country.³⁴

Equity crowdfunding

Equity crowdfunding is a relatively novel concept and does not play a big role in the European early stage investment sphere yet. Estimates of the annual investment volume range from EUR 150 to 300 million (in 2015)³⁵, which equates to 2-5% of the total early stage investment volume in Europe.³⁶ Equity crowdfunding is hindered by the legal frameworks in various countries, which lead to large differences in uptake across Europe.³⁷ The only countries with a somewhat substantial amount of equity raised via crowdfunding campaigns are the UK (EUR 260M), Germany (EUR 35M) and Sweden (EUR 20M). In the bigger picture these amounts are still very limited though, but growing.

To attract equity crowdfunding investments, innovators can apply for a fundraising campaign on a crowdfunding platform. Several platforms that specialise in cleantech / low-carbon investments exist, such as Abundance Investment (UK) and Symbid (NL).

Venture capital funds

The 2015 venture capital (VC) investment volume in European early stage ventures is estimated to be between EUR 2.1³⁸ and 3.8 billion³⁹, which is worryingly low according to various sources.⁴⁰ In terms of VC investments as percentage of GDP, the EU scores very low (0,025%) compared to the US (0,33%). Within the EU, relatively strong countries in terms of VC investment are Denmark (0,11%), Luxembourg (0,08%) and Finland (0,05%). The larger economies score much lower with France, the UK and Germany all between 0,025% and 0,035% which is only a tenth of the US figure.

The European venture capital funds that are active in the clean energy sector are generally easily found on the internet. An overview of appropriate funds is included in the Vademecum for energy innovators that is delivered as part of this study.⁴¹ The specialised cleantech VCs are mostly based in Germany, UK, France, the Netherlands, Finland and Sweden, as shown in Table 2-4. While the larger players also consider investment opportunities outside of their home market, the dominant approach for VCs is to invest in opportunities in their home market and aim for an exit in five to seven years.⁴²

Table 2-4 Number and examples of cleantech VCs per country

Country	No. of cleantech VCs identified	Examples of key players
Germany	15	High-Tech Gründerfonds, eCapital

³⁰ <http://www.ban.be/voor-ondernemers> and <http://www.beangels.eu/entreprendre/processus/>

³¹ <http://www.aeban.es/socios/mapa-de-redes>

³² <https://www.business-angels.de/start-ups/>

³³ See for instance <http://www.angelfundinggermany.com/> and <http://www.euro-freelancers.eu/business-angels-services/>

³⁴ EBAN (2016) - European Early Stage Market Statistics

³⁵ AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

³⁶ EBAN (2016) - European Early Stage Market Statistics

³⁷ AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

³⁸ EBAN (2016) - European Early Stage Market Statistics

³⁹ AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

⁴⁰ CE Delft (2016) - Investment challenges of a transition to a low-carbon economy in Europe; AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

⁴¹ See deliverable D3: Vademecum for energy technology innovators

⁴² Interviews with several EU venture capital funds. Consistent with findings from 'AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses' where 70-90% of VC investments are reported to be in the same region.

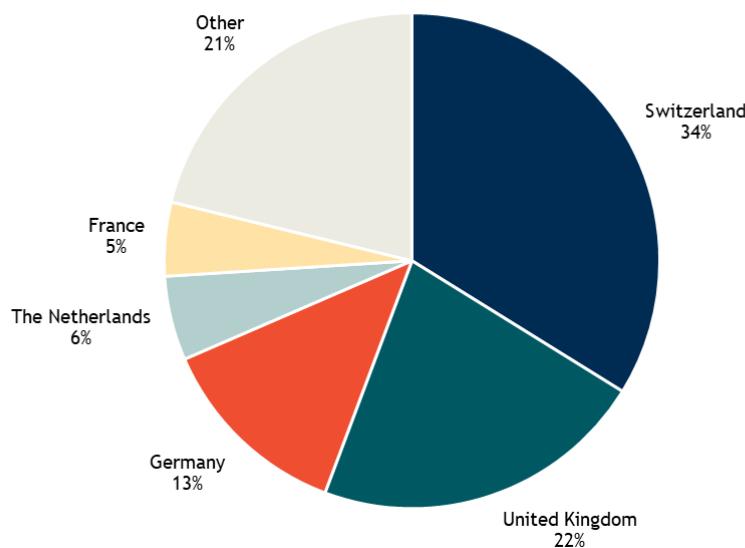
UK	11	Ecomachines, Octopus Ventures, IP Group
France	10	Aster Capital, Demeter, Idinvest
The Netherlands	6	Icos Capital, Syllion Ventures
Finland	4	Cleantech Invest, VNT Management
Sweden	4	Industrifonden, Northzone
Switzerland	3	Emerald Technology Ventures
Spain	3	Caixa Capital Risc, JME Venture Capital
Ireland	2	Kernel Capital
Belgium	2	Capricorn Venture Partners
Portugal	2	Armilar Venture Partners

Source: Own elaboration based on web-search performed as part of this study.

Family offices

The volume and sectorial distribution of family office investments is largely unknown due to a lack of data. The number of European family offices is estimated to be over 700.⁴³ Those are concentrated in Switzerland, the United Kingdom and Germany (see Figure 2-7) and are virtually absent in Eastern Europe.

Figure 2-6 Share of total number of EU family offices per country



Source: Own elaboration based on <http://familyofficedatabases.com/custom-buy/>

Apart from a few exceptions⁴⁴, most family offices do not have a website and cannot be found via network organisations. Only in Switzerland, a database of family offices is publicly available.⁴⁵ A potentially relevant best practice from outside Europe is the US-based Cleantech, Renewable Energy and Environmental Opportunities (CREO) syndicate, which unites family offices to be more effective in the cleantech sector. Such a network could help mobilising EU family office funds for the EU cleantech

⁴³ <http://familyofficedatabases.com/custom-buy/>

⁴⁴ See for instance <https://www.walerud.com/>

⁴⁵ See http://www.investmentoffice.com/io/Family_Offices/Family_Offices_Europe.php

sector as well, a sector that family offices would in general be attracted to as they often care about social objectives.⁴⁶

Corporate investors

The category of corporate investors is somewhat ambiguous due to the different investment models that corporates apply. Some set up dedicated Corporate Venture Capital (CVC) funds that are advertised to the public as a potentially relevant investor. Others take a more pragmatic approach and invest directly from their balance sheet when an opportunity arises. Public statistics do not always include all varieties of corporate investments and do not clearly differentiate between early and later stage investments, which makes it tricky to report investment volumes for this category. Nevertheless, a recent publication has provided some ballpark figures, estimating Germany's corporate venture capital investments to amount to EUR 2 billion, the UK at EUR 800 million and France at EUR 300 million.⁴⁷

The official CVC funds are easily found on the internet. Some of the major CVCs are listed in Table 2-5. Here, the same geographical pattern emerges as for the other investor types, with most of the investors located in Western Europe. Furthermore, it can be observed that CVCs that are active in innovative energy technologies typically spring from utilities, oil & gas companies, or manufacturing conglomerates.

Table 2-5 Selection of European corporate venture capital funds active in the cleantech sector

Name	Home markets	Industry of parent company
Inven Capital (CEZ Energy Utility)	Czech Republic	Utility
Total Energy Ventures	France	Oil & Gas
ENGIE New Ventures	France	Utility
EnBW New Ventures	Germany	Utility
Next47 (Siemens)	Germany	Manufacturing
Phoenix Contact Innovation Ventures	Germany	Manufacturing
Innogy Ventures	Germany, UK	Utility
Eneco Innovation and Ventures	Netherlands	Utility
Shell Technology Ventures	Netherlands, UK	Oil & Gas
DSM Venturing	Netherlands, USA	Materials
Agder Energi Venture	Norway	Utility
Statkraft Ventures	Norway, Germany	Utility
Statoil Energy Ventures	Norway, UK	Oil & Gas
Iberdrola Ventures - PERSEO	Spain	Utility
ABB Technology Ventures	Switzerland, Sweden, USA	Manufacturing

Source: Own elaboration based on web-search performed as part of this study.

While the typical maturity and investment volume of the energy ventures in scope of this study fit well with the requirements of corporate investors, some interviewees stressed that this investor type may not be as ideal as it seems. Some CVC funds are for instance not very active when it comes to making concrete investments. Others may have mixed incentives when it comes to developing innovative energy ventures as the success of the venture may eventually come at the expense of their core business.

⁴⁶ <http://incmind.com/2013/10/18/in-praise-of-family-offices/>

⁴⁷ AFME (2017) - The Shortage of Risk Capital for Europe's High Growth Businesses

2.4 Key players: Matching platforms

2.4.1 Scope and definitions

In addition to the innovators and investors defined before, a third group of key players is distinguished under the name ‘matching platforms’. While innovators and investors may find each other without using any intermediary platform, there may be cases where a matching platform could facilitate establishing fruitful contacts that would not have come about otherwise. Furthermore, matching platforms can be used as a tool for policy makers to contribute to the investment community’s functioning at limited costs compared to the provision of grants and subsidies.

Matching services are offered by a variety of parties such as accelerators, crowdfunding platforms, match-making events, online matching services and fundraising advisors. These different parties all offer services to establish contacts between investors and innovators but differ significantly in terms of their approach and scope, as outlined in Table 2-6.

Table 2-6 Typical characteristics of entities that offer matching services

Accelerators		Crowdfunding platforms	Match-making events	Online matching services	Fundraising advisors
Typical maturity	TRL <7	All stages	TRL >7	TRL>7	TRL >7
Format	Offline, standardised programme	Online, standardised service	Offline, standardised events	Online, standardised service	Offline, customised service
Offer	Services, capital	Capital	Services	Services	Services
Examples	Accelerace, Cleantech Camp, Climate-KIC Accelerator	See previous section on equity crowdfunding	Ecosummit, Cleantech Forum Europe, Slush, The Business Booster	Angellist, French Cleantech, Innvestment	Cleantech Capital Advisors, Chausson Finance
Relevant for scope of study?	Limited	Not as matching platform	Yes	Yes	Limited

Source: Own elaboration

As shown in the table above, match-making services are offered by a broad variety of actors. However, not all of them are relevant for the scope of this study. **Accelerators** are for instance of limited relevance as they generally focus on too low maturity levels and are not primarily focused on match-making with investors but rather focus on developing the business and co-invest themselves where necessary. As such, they are a relevant entity for innovators but less when it comes to finding the right investors from TRL 7 onwards. **Crowdfunding platforms**, on the other hand, are very focused on match-making with investors but are better understood as investors themselves as the innovator does not liaise directly with the people providing the money. As such, crowdfunding platforms are included in our section on investors. **Match-making events** are focused on establishing first contacts between innovators and investors and are therefore of specific relevance for this section on matching platforms. Also, **online matching services** which connect a broad range of investors with innovators are very relevant as they may fulfil the same role as the match-making events. Finally, **fundraising advisors** (also known as placement agents) play a role in establishing contacts between investors and innovators. But since they generally work more informally with customised, offline services, they are not easily generalised and targeted for the purpose of this study and are therefore not studied in detail.

2.4.2 EU landscape

The EU landscape of match-making events includes several cross-EU initiatives. One of the most relevant EU initiatives is **Ecosummit**, which consists of a series of events that take place annually in Berlin, Amsterdam, Stockholm, London and Paris. These events involve a large share of the key investors for innovative energy technology ventures which makes them very relevant for clean energy innovators. Other noteworthy cross-EU matching events include:

- **The Business Booster** which is an annual European event organised by InnoEnergy. The 2-day programme facilitates match-making between sustainable energy start-ups, investors and corporates;
- **Initiate!** which is held during the European Utility Week and offers a start-up programme to connect the key players of the start-up ecosystem;
- **Cleantech Forum Europe** which brings upcoming disruptive cleantech companies together with corporates and investors;
- **Slush**, an event that brings the world's leading tech start-ups together with investors and other stakeholders.

Additionally, a large number of local /regional match-making events are organised throughout the EU. **Tech tour**, for instance, organises several events through Europe to connect entrepreneurs, investors and corporates in a range of sectors including cleantech (e.g. the Nordic Venture Forum). Further examples are **Innov'eco** (France) and the **High-tech Venture Days** (Germany). It should be noted, however, that the distinction between cross-EU and local events is blurred as most events are open to an international audience.

Furthermore, several online match-making services are available such as:

- **Angellist** which selects and circulates investment opportunities to investors;
- **The European Investment Project Portal (EIPP)** which provides a free platform to link investment opportunities and investors;
- **French Cleantech** which showcases cleantech ventures to potential investors;
- **i3** which provides a platform where innovators can create a profile and corporate investors can scout for investment opportunities;
- **Innosix** which helps business corporations discover leading-edge technology companies through their online match-making platform (see the ETEQ case study for more information);
- **Innvestment** (Germany) which runs a digital platform to connect investors with start-ups.

3 Reasons for not investing

It is widely recognised that clean energy technology innovators struggle to attract investments. To a certain extent, this can be regarded as a healthy process of selecting the most promising innovations for continued development and discontinuing the work on innovations that are not feasible or desirable. But part of the reasons for failure to attract investments are not necessarily linked to the feasibility or desirability of the innovation. Both European⁴⁸ and international studies⁴⁹ report several other issues that prevent clean energy innovations from reaching commercialisation and wide scale adoption.

In the context of this study, it is important to distinguish between two types of reasons for the lack of investment in clean energy technology ventures. The first type comprises of issues that are inherent to the clean energy innovation sector, such as the risks resulting from the dependence on subsidies and the long development pathways to bring technological innovations to the market. While such reasons constitute important barriers to investment, they cannot be resolved by initiatives to build a better functioning investment community. Instead, they require broader interventions such as long-term carbon pricing and increased public investment funding. We label this type of reasons as '**intrinsic issues**' for investing in the sector.

The second type includes issues such as the lack of financial knowledge at the innovator and business plans that are not sufficiently developed when reaching out to potential investors. These reasons can be addressed by initiatives to build a better functioning investment community and are therefore of primary relevance for this study. We label these reasons '**transactional issues**' for investing in the sector.

Finally, it is important to recognise that the investment decision depends on a complex interplay of various factors. Isolating the impact of individual issues is therefore not realistic. Drafting an overall view of the main issues is feasible and informative though and will be done in the next section.

3.1 Identifying the issues

In this study, we have collected inputs from a wide range of sources to arrive at a balanced view of the issues that obstruct investments in clean energy innovations in Europe. These sources are:

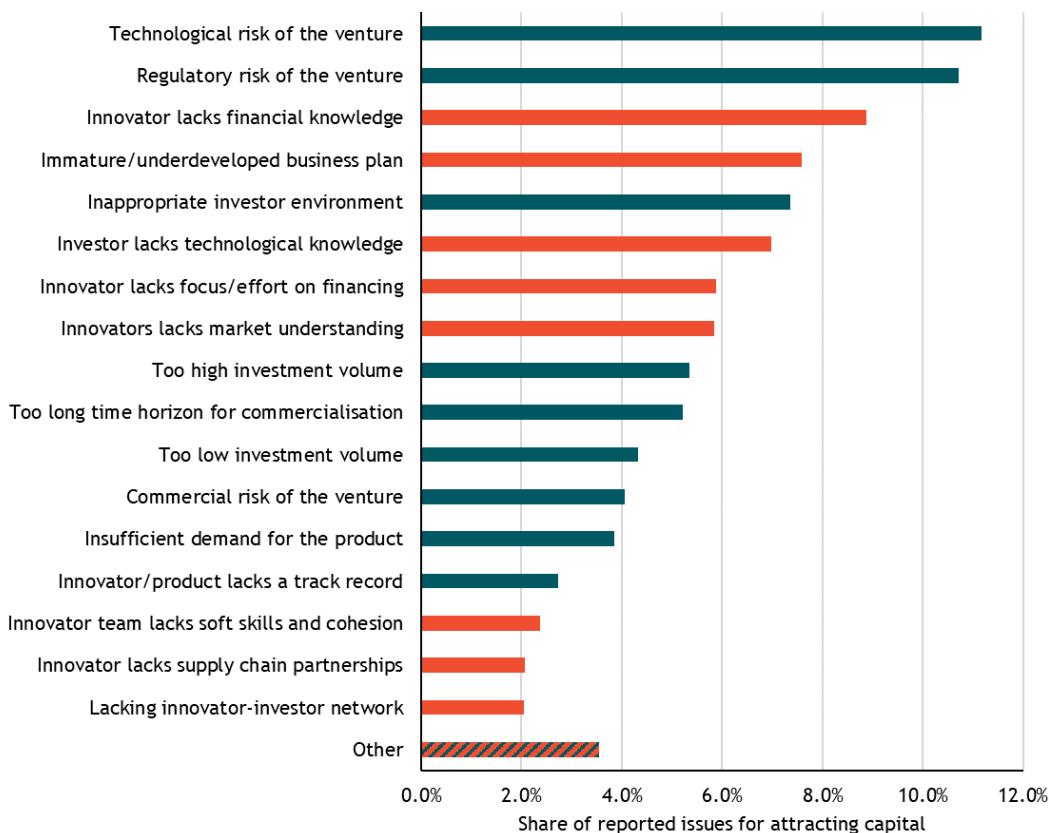
- 27 project fiches on European energy technology ventures (Deliverable D2: Project portfolio);
- 4 case studies with energy technology innovators (see Annex 1);
- 4 case studies with matching platforms and other intermediaries (see Annex 1);
- 6 interviews with innovators (listed in Annex 2);
- 12 interviews with investors (listed in Annex 2);
- 5 interviews with matching platforms (listed in Annex 2);
- 4 interviews with other stakeholders (listed in Annex 2).

⁴⁸ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

⁴⁹ Gaddy et al. (2016) - Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation; Jenkins & Masur (2011) - Bridging the Clean Energy Valleys of Death.

Based on the inputs from these sources, we identified and categorised the issues that obstruct investments at the stage of TRL 7 to 9. Figure 3-1 provides an overview of the share per issue of the total set of reported issues for attracting capital and differentiates between intrinsic and transactional issues.

Figure 3-1 Main intrinsic issues (green bars) and transactional issues (orange bars) for attracting capital



Source: Own elaboration based on project fiches, case studies and interviews.

This overview of issues illustrates that intrinsic issues such as technological and regulatory risk are considered important reasons for the lack of investment. However, transactional issues such as a lack of financial knowledge on the innovator side and a lack of technological knowledge on the investor side are also considered important barriers to increased investments in the sector. Hence, efforts to develop the investment community that overcome such issues could definitely contribute to raising the investment volumes in the sector. Still, one needs to be realistic that the intrinsic issues may constitute such an important barrier to investing that a better functioning investment community may not be able to compensate for. A business case that is too risky will remain a stumbling block. A better functioning investment community should therefore not be seen as a panacea but rather as an enabler for increased investments in a context of other supportive measures.

In the next sections, we discuss the intrinsic and transactional issues in more detail and supplement the findings with complementary analyses on the collected inputs and findings from the literature.

3.2 Intrinsic issues

The main intrinsic issues for investments in clean energy ventures are the high risks associated to such ventures, the volume of the investment required, the inappropriate investor environment, the time horizon for commercialisation, the expected demand, and the lack of a track record. While such issues cannot be resolved with an improved investment community, a proper understanding of these issues is still essential for appreciating the complexities and guiding other measures to increase the investments in the sector. Hence, we provide a high-level view on these issues in the next sections.

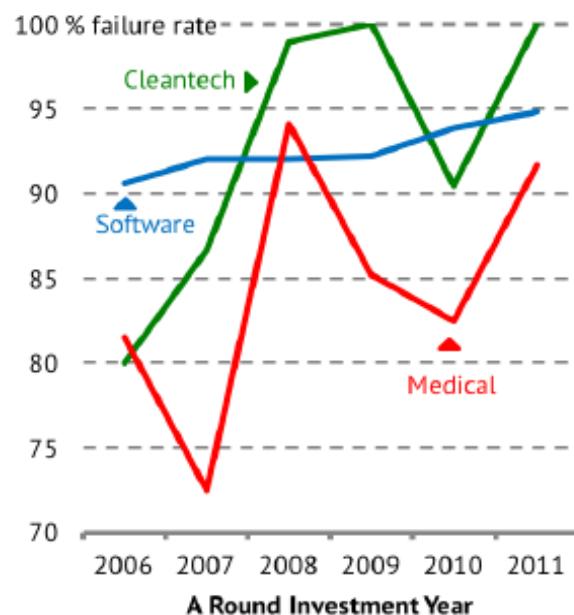
3.2.1 Technological, regulatory and commercial risk

The history of clean energy investments has shown high failure rates. A comprehensive study on the success rate of cleantech investments by MIT clearly illustrates this point (see Figure 3-2).⁵⁰ Their research highlights failure rates (i.e. the failure to return capital to the investors) that are significantly higher in the cleantech sector than in the software and medical sectors. Hence, it comes as no surprise that risk is one of the most cited barriers to investment in clean energy ventures.

One of the most important categories of risk is **technological risk**. This risk results from the unpredictable nature of the development of technological innovations. Will the engineers manage to deliver the expected performance in practice? And how much time and money is required for doing so? Indeed, a frequently cited issue is that timelines and budget estimates are not met due to technical issues, which naturally poses a risk to the returns for investors.

Regulatory risk poses another challenge to attracting capital. Clean energy technologies are supported by feed-in-tariffs, subsidies and other incentives to improve the business case. But the history of clean energy support schemes in Europe has shown that the continuation of such support schemes cannot be taken for granted. Notorious examples are the retroactive changes to the support schemes for renewables in Spain and the Czech Republic which have significantly reduced the willingness to invest in energy technology ventures in Europe.⁵¹ A welcome contribution for mitigating this risk is the anti-retroactivity clause stipulated in the Commission's winter package.⁵² But also the future carbon prices resulting from the EU Emissions Trading Scheme (ETS) cause uncertainty and risk with respect to the

Figure 3-2 Failure rate of early stage investments in various technology-driven sectors



Source: Gaddy et al. (2016) - Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation

⁵⁰ Gaddy et al. (2016) - Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation

⁵¹ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

⁵² http://europa.eu/rapid/press-release_MEMO-16-3987_en.htm

business case for the technological innovations that are under development. Furthermore, uncertainty in receiving the required permits is cited as a risk factor by several sources.⁵³

In addition to these risks, the commercial viability of the innovation can be uncertain. Competitors may enter the market at an earlier stage and the eventual costs of the product will only become apparent once the technology is manufactured at a significant scale and the supply chain has matured. As such, the **commercial risk** can also be significant.

The impact of the high level of risk of energy technology ventures is exacerbated by the characteristics of the energy industry. Compared to sectors such as pharmaceuticals and IT, the energy sector has a much lower risk tolerance which explains the reluctance of the main players in the sector to invest (e.g. of the utilities).⁵⁴

3.2.2 Investor environment and the required investment volumes

Another key intrinsic issue is the inappropriate investor environment which includes issues such as the lack of sufficient and appropriately sized venture capital funds in the EU and the stringent requirements imposed on banks and institutional investors because of the Basel III accord.⁵⁵ These circumstances lead to gaps in the funding options for specific stages of development of the innovative energy ventures. Innovators that for instance require an investment of EUR 20 million would have a hard time finding European venture capital funds that are willing and able to invest such amounts. While this issue may be solved by syndicating with other VCs and corporate investors, the relatively small investment volumes of European VCs does require a larger number of parties to be involved which adds to the complexity. Meanwhile, European banks and institutional investors would not be able to invest in such risky enterprises. In the US, these issues are less prominent thanks to the larger size of the investment funds which allows for larger sums to be invested per venture (see Figure 3-3). Furthermore, European utilities that could function as corporate investors are generally in a financially unhealthy situation which limits their possibilities to invest⁵⁶ and various venture capital funds have focused on other sectors due to the below-par performance of clean energy investments⁵⁷.

⁵³ Several project fiches (Deliverable D2) and ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

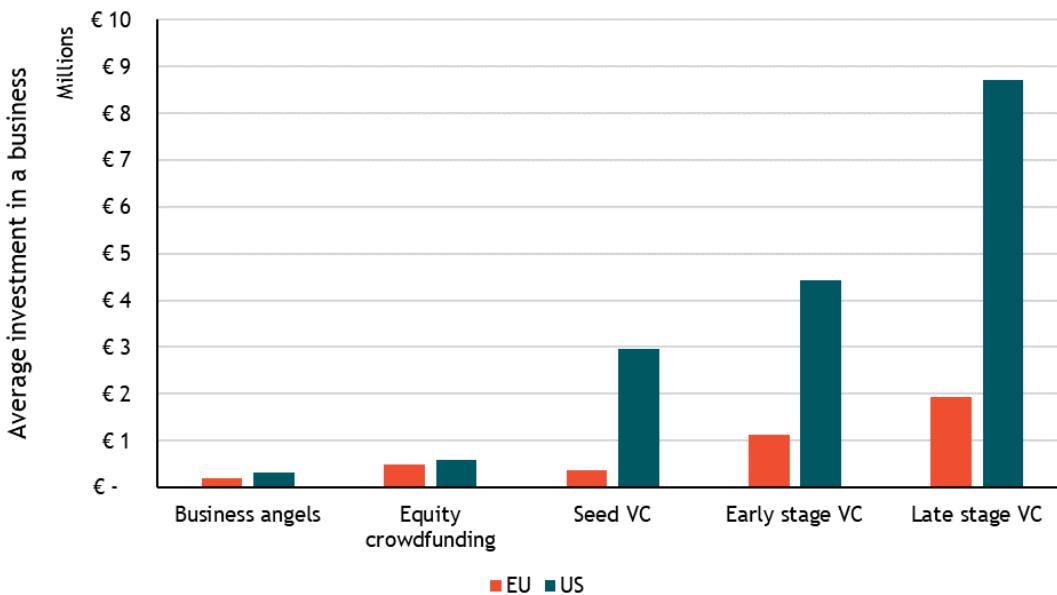
⁵⁴ Jenkins & Masur (2011) - Bridging the Clean Energy Valleys of Death.

⁵⁵ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

⁵⁶ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

⁵⁷ Various interviews with VCs

Figure 3-3 EU and US average investment volumes per investor type (all sectors)



Source: Own elaboration based on AFME (2017) - *The Shortage of Risk Capital for Europe's High Growth Businesses*

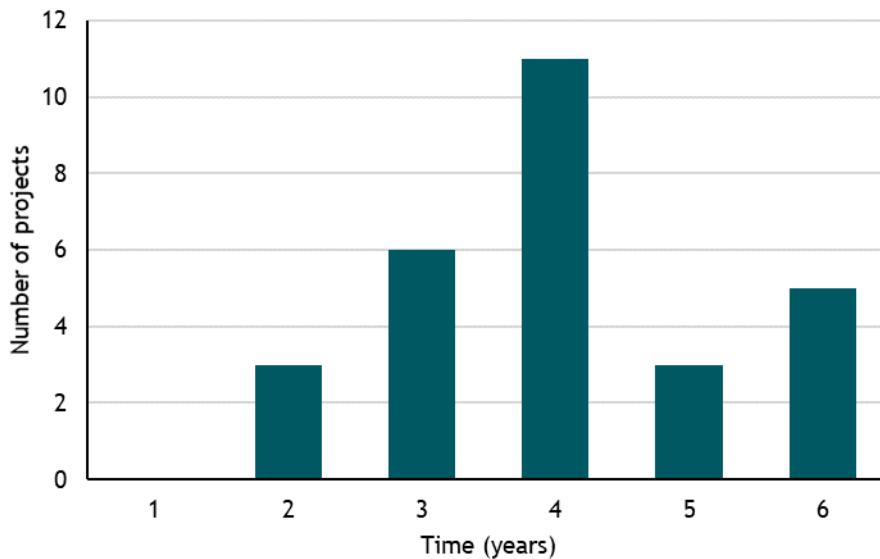
The reported issues on too high and too low investment volumes are closely linked to this issue as they have the same root cause. Innovators that approach business angels and venture capital funds would often receive the feedback that their capital requirements are too high to be fulfilled by these investor types. At the same time, the investment volume may be too low to attract EIB funding as well as funding from corporate investors.

3.2.3 Time horizon for commercialisation

Technological innovations in the energy sector often require a long development period before they can be commercialised, let alone before a positive cash flow can be realised. The entrepreneurs of the 27 innovative energy ventures that are included in the project portfolio delivered as part of this study estimate that a positive cash flow will be realised in two to six years with most expecting a duration of four years (see Figure 3-4). Such time horizons are generally considered rather long for investors such as venture capital funds who would generally aim for an exit in five to seven years.⁵⁸ Taking into account that entrepreneurs are generally too optimistic with their expectations, it comes as no surprise that a lengthy time horizon for commercialisation and positive cash flow is a frequently mentioned obstacle to investment in the sector. Unfortunately, there is no clear solution to this mismatch between reality and investor preferences which leaves it as a truly intrinsic barrier to investment for the sector.

⁵⁸ Interview inputs

Figure 3-4 Expected time to positive cash flow for the 27 projects studied in detail



Source: Own elaboration based on deliverable D2 (Project portfolio)

3.2.4 Insufficient demand

The innovative energy technologies that are developed in Europe vary from potentially large-scale energy sources to niche applications. Especially for the latter, the potential market size can be an issue for attracting sufficient capital to start manufacturing at a sufficiently large scale to become cost competitive. Examples include applications for specific energy resources such as rivers where small-scale hydro technologies can be deployed, coastal areas to deploy ocean salinity gradient technologies, biomass resources for bioenergy technologies and areas with a suitable subsurface for geothermal technologies. While such resources are theoretically vast, practical issues such as social acceptability and interference with ecosystems may limit the scale at which such technologies can be deployed. Combined with the fact that the technologies eventually have to compete with other sources of energy on the basis of cost, there is little room to compensate for low sales volumes by selling at a higher price.⁵⁹ In addition to this, incumbents may be reluctant to include new energy sources to the mix in markets with excess capacity. As a result, investors may judge the potential demand and revenues as too limited to invest in the technology.

3.2.5 Lack of a track record

The final intrinsic issue that is frequently cited as a barrier to investment is the lack of a track record of either the innovator or the technology. Especially first-time entrepreneurs can experience significant issues to attract capital as their lack of experience amplifies the technological, regulatory and commercial risks.⁶⁰ While this lack of a track record is intrinsic to the entrepreneur and the venture, it links closely to the issue around the team composition which is covered in the next section on transactional issues. Recruiting more experienced team members may help to overcome this issue.

⁵⁹ Exceptions are products that service remote areas such as offshore facilities and isolated communities.

⁶⁰ This issue is discussed in more detail in the guide (vademecum) that is delivered as part of this study

3.3 Transactional issues

The main transactional issues include the lack of financial knowledge of the innovator, underdeveloped business plans, the lack of technical knowledge of the investor, the lack of market understanding and supply chain partnerships, lacking soft skills and team cohesion and the lack of a network between innovators and investors. These issues are the core subject of this study as they can be alleviated by efforts to build a better functioning investment community. In this section we elaborate on these issues and in the next chapter we discuss potential services that matching platforms could offer to overcome these issues. Furthermore, several of these issues are discussed in more detail in the handbook (vademecum) for innovators that is delivered as part of this study.

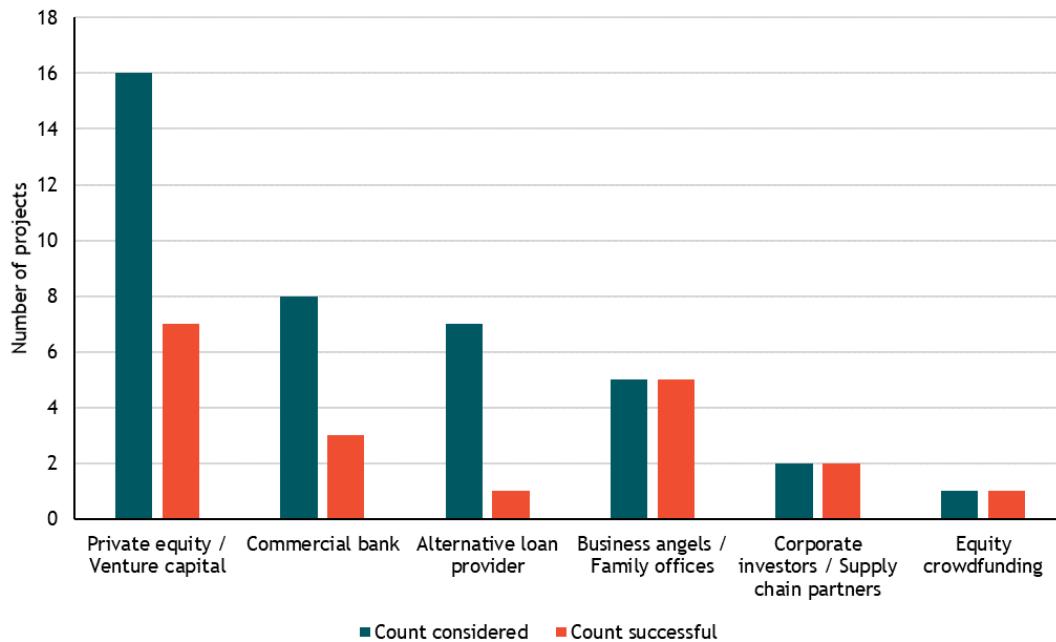
3.3.1 Innovator lacks financial knowledge and focus on financing

The most mentioned transactional issue in our research is the innovator's lack of financial knowledge. Another closely related and often mentioned issue is the lack of focus on financial aspects by the innovator. Concrete examples of these issues include that:

- The innovator has unrealistic expectations in terms of ownership transfer when approaching venture capitalists. In some cases the innovator is not willing to give up any ownership in return for capital or requires a majority stake throughout the whole development of the venture, which is generally not realistic;
- The innovator has difficulties to assess and properly stage the future capital requirements. He aims for too high amounts at once, which can lead to overspending in the early stages;
- The innovator has challenges to identify suitable investors. Especially investor types other than venture capital funds tend to be difficult to identify;
- The innovator allocates too little time and effort to identifying the right investors, meeting with potentially interested investors and preparing and executing the due diligence. This leads to an inefficient process and a suboptimal impression at the investors that are approached.

The issues around identifying suitable investors becomes apparent when analysing the sources of finance that the studied projects have approached and the success rate with those sources of finance. Figure 3-5 shows which sources of finance the innovators included in the project portfolio have approached and the respective success rates.

Figure 3-5 Number of projects that have targeted specific sources of finance and their rate of success



Source: Own elaboration based on project portfolio (Deliverable D2 of this study)

Note: Innovators generally approach multiple sources of finance per type, which is not shown in the above analysis. Instead, the figures present if they have been successful at raising capital from the respective source, irrespective of the number of attempts.

The above analysis shows that private equity / venture capital is the most common source of finance that innovators approach. As discussed earlier, especially venture capital funds are appropriate for the capital and risk requirements of the innovator and are therefore a valid target. Commercial banks and alternative loan providers on the other hand are less appropriate which also translates to a low success rate. Conversely, business angels / family offices, corporate investors / supply chain partners and equity crowdfunding are less often considered while the success rate at these sources of finance is much higher. Overall, this analysis indicates that innovators generally lack sufficient financial knowledge to target the most suitable sources of finance.

3.3.2 Immature/underdeveloped business plan

A more general and cross-cutting transactional issue is the lack of a properly developed business plan when the innovator reaches out to potential investors. This issue has been flagged by both the innovators and the investors and is confirmed by a recent study on the topic.⁶¹ The root cause of this issue can either be an overall lack of maturity of the business or the result of a lack of effort and skill in putting the business plan together. In case of the former, it is simply too early for the innovator to attract capital from the investors that are approached. Continued reliance on grant financing or seed stage investors would then be more appropriate. In case of the latter (i.e. a lack of effort in putting the business plan together), the issue is more transactional in nature and could potentially be alleviated by increased support for the innovator. Moreover, the innovator needs to recognise that the business plan is an evolving document that should be updated once new feedback from customers and partners is received.⁶²

⁶¹ ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy.

⁶² Enervais case study

3.3.3 *Investor lacks technical knowledge*

Perhaps unsurprisingly, the more pressing issue at the investor side is a lack of technical knowledge, as opposed to the financial knowledge that is missing at the innovator side.⁶³ This issue translates to difficulties in understanding the competitive advantage of the technology and the risks for developing and deploying the technology. As a result, the risks may be overestimated which could prevent investments from happening.

The most common solution to this problem is to hire in-house experts who can provide a second opinion on the technology. However, the small size of the clean energy sector and the existence of a large variety of competing technologies and sub-technologies often does not make it feasible to hire technical experts due to the limited deal flow.

3.3.4 *Innovator lacks market understanding and supply chain partnerships*

Several investors stressed that the main challenge for innovators is not to find the right investors but rather to find their future clients. If an innovator can establish a clear view on the future client base as well as preliminary sales agreements, it will become much easier to attract capital. A prerequisite for doing this successfully is to have a thorough understanding of the trends in the market and the specifics of the different regions and market segments that can be targeted. Additionally, a well thought through supply chain accompanied by partnerships with suppliers and distributors can greatly contribute to the appeal of the business case for investors. For immature technologies such as wave energy it may also be fruitful to partner with competitors that share the objective of building a market for the energy technology.

In practice, these aspects are not always well-prepared when investors are approached. Concrete recommendations from venture capital funds, business angels and experienced innovators include:

- “*Focus on the customer, get their feedback*”;
- “*The investor is a secondary player, there must be a match between the innovator and the market. If there are no potential sales, there will be no investors. For example, energy efficiency is so difficult to sell: you cannot see the product (showing capital savings is not enough), so it is hard to find private investors for innovative energy efficiency ventures*”;
- “*First, do your homework better, know the fundamentals of product design, financial modelling. These are things that are not being done a lot. You must understand the market better, especially in foreign target countries. You must understand how to get a supply chain going, especially in other target countries*”;
- “*The first priority of the due diligence is to talk to potential customers to understand how the product fulfils their requirements*”;
- “*Target the appropriate countries. Only verbal support for renewables is not sufficient*”.

These issues are exacerbated when investors also do not focus enough on properly understanding the market potential, which has led to unsuccessful investments and consequently to reputational damage for the sector.⁶⁴

⁶³ Mentioned by several innovators of the projects studied for the project portfolio and confirmed by the Enervalis case study, several supplementary interviews and the literature (ICF & London Economics (2016) - Innovative Financial Instruments for First-of-a-Kind commercial-scale demonstration projects in the field of energy)

⁶⁴ Aurelia case study.

3.3.5 Innovator team lacks soft skills and cohesion

When asking investors about their investment criteria they often indicate that the strength of the innovator's team is the primary criterion. Only once the investor is confident that the team is capable to run a business successfully, they proceed to a more in-depth assessment of the company. For the innovator to pass this first evaluation criterion it is key that they possess sufficient commercial, communicative and organisational skills to bring their innovation across in a convincing way. Unfortunately, the innovator does not always have these skills. This does not need to be an insurmountable issue though, as the solution can be as simple as hiring an additional team member that can take on this role.

Another issue is the lack of cohesion between the team members. Just as much as investors want to see a team that has the required skill-set, they would want to see a team that works well together. Various investors quoted experiences with businesses failing due to internal struggles in the management team. Any indication of such struggles prior to investing can become a showstopper for the investor.

3.3.6 Lacking innovator-investor network

The final frequently mentioned transactional issue is the lack of a network between innovators and investors. The consulted parties report issues on both sides. On the one hand, innovators sometimes lack a network in the financial sector which makes it more difficult to identify the right investors. On the other hand, investors do not always have a clear view on the innovative projects that require investments, limiting their ability to proactively approach innovators. This lack of interaction does not help to achieve a better understanding of each other's motivations and functioning and thereby exacerbates other issues such as the lack of financial knowledge at the innovator and the lack of technological knowledge at the investor.

4 Facilitating increased investments

As outlined in the previous chapter, there are various issues that prevent investments in innovative energy technology ventures from being made. Some of these issues are intrinsic to the sector and cannot be resolved by building a better European investment community. At the same time, several transactional issues exist that may be alleviated by efforts to build a stronger investment community. In this chapter, we focus on the latter. First, we provide insight into best practices in the existing matching platforms that may be applied more broadly and consistently. Secondly, we discuss potential complementary services that may be offered by matching platforms to deal with the most important transactional issues. Finally, we compare the configuration of the existing matching platforms with the potential services to alleviate the transactional issues and the best practices in order to identify any gaps in the current offerings.

4.1 Applying best practices

A potential way to stimulate investments in innovative clean energy technologies is to apply best practices to the core business of matching platforms more consistently. That is, to apply best practices with respect to the execution of match-making events and online matching services.

Our case studies (Annex 1) and complementary interviews (interviewees listed in Annex 2) highlight the following best practices for effective match-making:

- a. **Invite multiple investor types:** While venture capital funds may be appropriate for one innovator, business angels may be more appropriate for another innovator. And yet another innovator may benefit more from a large corporate investor. Match-making services should accommodate for these differences by inviting a diverse group of investor types, thereby maximising the chances of fruitful encounters. Additionally, the right staff of the investors should be present. Especially delegates from corporate investors are not always equipped to properly assess investment opportunities and/or decide upon further pursuing the investment opportunity which reduces the effectiveness of their participation;
- b. **Hold small, regional events:** As investors and innovators would need to work together intensively, both parties prefer opportunities within their region. Match-making services should therefore be focused on a specific region and invite innovators and investors that are active in the respective region. A shared understanding of the target sales market for the innovation can in some cases also be important. For instance, if the innovation has most potential in the Chinese market, inviting an investor that is familiar with the Chinese market would be of added value;
- c. **Focus on specific technologies:** Innovative clean energy technologies cover a broad range of disciplines and technologies which makes it hard to understand all of them. Hence, match-making services are more effective if they limit the scope of technologies covered and only invite investors that are knowledgeable and willing to invest in the respective technology;
- d. **Keep a focused agenda:** Match-making events are most effective when there is a focused agenda. Innovator pitches, speed-dating with potentially interested investors and flexible meeting slots to discuss investment opportunities in more detail should be the core elements of the agenda. Loosely related presentations on general trends, research and policies should be limited or may not feature at all;

- e. **Prepare for the event:** Summary sheets of the innovative ventures pitching at the event and brief descriptions of the investors that are present should be circulated beforehand. Ideally, prior work is done to assess which investors and innovators would like to meet each other and these meetings are already scheduled.

Matching platforms that incorporate these best practices should be successful in attracting high levels of participation and stimulating increased investments in the sector, especially if combined with the complementary services described in the next section.

4.2 Overcoming the main transactional issues

In addition to the application of best practices, matching platforms may also become more effective if they expand their services to target the main transactional issues identified in the previous chapter. In this section we reflect on potential services that matching platforms may offer to assist in overcoming these issues.

4.2.1 Innovator lacks financial knowledge and focus on financing

The lack of knowledge and focus on financing that innovators face should be one of the primary areas to target. Matching platforms could assist in reducing these issues by supporting innovators in their preparation for reaching out to investors. This could include support to determine the right investment sum to aim for, identify the right investor types to approach and set the right expectations in terms of the stake in the business that the innovator should be willing to give in return. This support could be organised in the form of **trainings** to educate the innovator on the topic. Alternatively, feedback and advice on their plans to attract financing could be provided. Both types of support could be offered by **financial experts** and should ideally be scheduled ahead of match-making events in which the innovator could benefit from their improved understanding and preparation on attracting financing.

4.2.2 Immature / underdeveloped business plan

In cases where the business plan is not sufficiently developed the innovator requires more general support on building a successful business. **Seasoned entrepreneurs** would probably be best equipped to offer this support as they should be able to advise on the broad range of disciplines that should be covered in the business plan, such as R&D, sales, operations, financing and human resources. Matching platforms could incorporate these services to their offerings although it must be recognised that this support is less closely linked to their core business of matching innovators and investors to enable investments. If services to develop the business plan would be incorporated in their offerings those could also be delivered by means of **trainings** or **advisory services**.

4.2.3 Investor lacks technical knowledge

Matching platforms could play a central role in reducing the impact of a lack of technical knowledge at the investor. While hiring technical experts is often not worthwhile for the investors themselves due to the limited deal flow, it could be more feasible in the context of dedicated match-making events on specific energy technologies. A dedicated event on a specific energy technology (e.g. geothermal energy) may for instance invite an independent panel of **technical experts** to review the technical feasibility of the innovations. These **expert reviews** could either be provided as preparatory materials prior to the event or be presented during the event. If the technical experts are present during the event they could also provide **ad hoc advice** to the investors on any technical enquiries.

4.2.4 Innovator lacks market understanding and supply chain partnerships

A promising avenue for matching platforms to enter into is to support in linking with potential customers and supply chain partners. The organisation of **match-making events** that include **potential customers** and **supply chain partners** could leverage upon the expertise of matching platforms to bring stakeholders together and facilitate fruitful contact between them. These events could be organised in a prior stage to reaching out to investors or be combined into events that also facilitate contact between investors, potential customers and supply chain partners. Indeed, enthusiastic and dedicated future customers could be one of the primary arguments for investors to participate. Additionally, **advisory services** and/or **expert reviews by market specialists** could be offered to assist the innovator in identifying the right markets to target and to convince the investor of the sales potential.

4.2.5 Innovator team lacks soft skills and cohesion

Improving the innovator's soft skills could be supported by offering **trainings** on the most common skill gaps. Likely target areas are commercial, communication, and organisational skills which are not always well developed at technology-driven innovators. The most appropriate people to deliver such trainings would be experienced **management professionals** who possess well-developed training skills. When it comes to improving the innovator's team cohesion a suitable approach would be to offer team assessments and team building sessions. The team assessments would lead to an **expert review** of gaps in the team's skill set whereas the team building sessions are effectively a way of **training** the team in working together effectively. These services seem however less closely linked to the core business of matching platforms which would make it less straightforward to integrate them in the current offerings.

4.2.6 Lacking innovator-investor network

The final transactional issue concerns the lack of a network between innovators and investors. Facilitating the development of this network through **match-making events** and **online matching services** is the core business of matching platforms and would therefore probably not require additional services but rather stepping up the existing efforts.

4.2.7 Consolidated findings

The previous discussion on potential services that matching platforms could offer to overcome the most prevalent transactional issues shows that there are several opportunities for matching platforms to contribute to building the investment community. These opportunities utilise various delivery modes (training, advisory, expert reviews, match-making events) and involve a broad range of stakeholders in addition to the innovators and investors. Some of these services fit well with the core business of matching platforms as they utilise the existing capabilities while others are less closely related. Table 4-1 provides a summary overview of these aspects per potential service.

Table 4-1 Overview of potential services to overcome the transactional issues

Transactional issue	Potential services	Delivery mode	Key stakeholders	Matching platform fit
1. Innovator lacks financial knowledge and focus on financing	Education on financing	Training	Financial experts	High
	Feedback on plans to attract financing	Advisory	Financial experts	High
2. Immature / underdeveloped business plan	Education on business plan development	Training	Seasoned entrepreneurs	Medium
	Feedback on business plan	Advisory	Seasoned entrepreneurs	Medium
3. Investor lacks technical knowledge	Assessment of technical feasibility	Expert review	Technical experts	Medium
	Ad hoc advice on technical enquiries	Advisory	Technical experts	Medium
4. Innovator lacks market understanding and supply chain partnerships	Customers / supply chain partners - innovator match-making	Event	Customers & supply chain	High
	Advice on target market segments	Advisory	Market specialists	Medium
	Market potential assessment	Expert review	Market specialists	Medium
5. Innovator team lacks soft skills and cohesion	Development of soft skills	Training	Management professionals	Low
	Team assessment	Expert review	Management professionals	Low
	Team building sessions	Training	Management professionals	Low
6. Lacking innovator-investor network	Innovator - investor match-making	Event	N/A	Core business

Source: Own elaboration

The overview above indicates that services to improve the innovator's financial knowledge and to match potential customers and supply chain partners with the innovators would be a natural fit to the current activities of the matching platforms. These services utilise the core competences of matching platforms of match-making and finance and are therefore only a small step away from the current activities. For most other complementary services, a medium fit with the current capabilities of the matching platforms exists, except for the services to improve the innovator's soft skills and team cohesion, which require skills that are generally not core to matching platforms. Still, we judge that also these capabilities can be added if deemed sufficiently important. However, other stakeholders may be more appropriate for offering these services.

4.3 Identifying areas for improvement

The previous sections identified how match-making would be most effectively organised and what services would ideally be offered. The question is to what extent the existing matching platforms already fulfil these requirements for the innovators in scope of this study? Going by the inputs of the innovators from the case studies and interviews we see a mixed picture. Some innovators are rather negative about the currently offered match-making services and do not plan to attend them anymore. Others are more positive and see clear added value. In Table 4-2 we take a closer look at the characteristics of some of the main match-making services in Europe to identify any gaps and areas for improvement in the current offerings.

Table 4-2 Characteristics of a samples of the main European matching platforms

	InnoEnergy / Business Booster	Ecosummit	Cleantech forum	Slush	Tech Tour	INNOV'ECO	High-Tech Venture Days
General characteristics							
Geographical coverage	Europe	DE,NL,FR,SE,UK	Europe	Global	Europe	France	Europe
Thematic focus	Sustain. energy	Energy transition	Cleantech	Tech	Tech	Cleantech	High-tech
Maturity focus	<i>Start-up, growth</i>	'Bankable'	<i>Start-up, growth</i>	<i>Start-up, growth</i>	<i>Emerging, growth</i>	<i>Unknown</i>	<i>Start-up, growth</i>
Type	Public/Private	Commercial	Commercial	Not for profit	Unknown	Unknown	Unknown
Innovator registration fee	Unknown	€500+	\$1295+	\$295	Unknown	€160	€199
Application of best practices to innovator-investor match-making							
a. Multiple investor types	VC, Corp, Angels	VC & Corporate	VC & Corporate	VC & Corporate	VC, Corp, Angels	Unknown	VC & Corporate
b. Small, regional events	Large, European	Large, regional	Large, European	Large, European	Small, regional	Small, regional	Large, European
c. Specific technology focus	Moderately	Moderately	Little	Little	High	High	Little
d. Focused agenda	Moderately	Moderately	Little	Little	Unknown	Little	High
e. Preparatory inputs and meeting schedule	Yes	No	No	Yes	Unknown	No	Yes
Complementary services							
1. Financing	Advisory, reviews	Advisory	No	Mentoring	Potentially	No	No
2. Business plan development	Education, advis.	Potentially	No	Mentoring	Potentially	No	Feedback
3. Technology assessment	Due diligence	No	No	No	Potentially	Potentially	No
4.1 Customers / market	Networking, advis.	Advisory	No	Mentoring	Potentially	Networking	No
4.2 Supply chain	Potentially	No	No	Potentially	No	Potentially	No
5.1 Soft skills	Training	No	No	Recruitment	No	No	Pitch training
5.2 Team dynamics	Advisory	No	No	No	No	No	No

Source: Own elaboration based on websites of matching platforms and case study on InnoEnergy (see annex 1)

All the matching platforms that have been assessed include Europe and clean energy as one of their focal areas. Some are exclusively focused on those areas (e.g. InnoEnergy) while others have a broader scope and include other technological sectors such as healthcare, IT and food (e.g. Tech Tour). They all include TRL levels 7-9 in their scope but may use different terminology for describing the maturity levels in scope and may also have a slightly different focus. Ecosummit's focus on bankable ventures may for instance exclude some of the less mature innovators in scope of this study. Another difference between the platforms is the origin of their funding and whether they are geared towards making a profit. The registration fees charged to participating innovators illustrate how the profit motive may affect the innovator by charging a higher fee.

The assessment of the complementary services that are offered clearly shows the diversity of configurations across Europe. Where matching platforms such as Cleantech Forum are specifically focused on investor-innovator match-making, others offer various additional services. Especially InnoEnergy and its matching event The Business Booster provide a broad array of complementary services that innovators can benefit from, although it should be noted that part of these services should be attributed to their acceleration programme. Other noteworthy complementary services include Slush's recruitment service, which entails match-making between innovators and talented professionals, and the pitching training offered by the High-Tech Venture Days. Furthermore, several platforms offer services to assist the innovator with financing, business plan development and the identification of potentially interested customers. These services are highly relevant as they address key transactional issues in the sector.

In terms of applying best practices we observe that the most commonly invited investors are venture capital funds and corporate investors. While both are highly relevant, more diversification of investor types is considered valuable by the innovators. The inclusion of business angels in some of the events is therefore a positive feature. The size, geographical scope and technological focus of the events is not always organised in the most effective way for facilitating investments. Several matching platforms organise large, pan-European events that cover a broad range of technologies, which is less appropriate for realising fruitful contacts between investors and innovators. A noteworthy exception is Tech Tour, which organises small, regional events with a clear technology focus. The agenda setting and preparatory requirements of the events are also an area that could be organised more effectively. Several matching platforms set agendas that are too broad for the purpose of match-making, with plenary sessions on general trends and developments rather than focused pitching and match-making. Additionally, meetings are not always pre-scheduled and descriptions of the innovations are not always required to be shared beforehand. A best practice on these aspects are the High-Tech Venture Days which pre-book meetings, assess and share one-pagers on the innovations before the event and apply an agenda focused on pitching and match-making.

5 Conclusions

The investment community for innovative clean energy technologies can be defined as the group of people who can play a role in increasing the volume invested in these technologies in Europe. The key players of the investment community are the innovators, investors and matching platforms that are active in the sector. The **innovators** in scope of this research are those at technology readiness level 7, 8 and 9 and include innovations in renewable energy sources and energy smart technologies such as energy efficiency, storage and smart grids. We observe that the European innovation activity spans a broad range of technologies and is centred in Western-European countries such as Spain, Germany, Italy, the UK and the Netherlands. The typical size of the investments that these innovators require is between EUR 3 and 80 million. The most relevant **investors** for these innovators are venture capital funds and corporate investors as they have the right preferences in terms of maturity and investment volume. Other relevant investors are crowdfunding platforms, angel investors and family offices although the required investment volume will often be too high for these investors to fulfil by themselves. The functioning of the investment community for innovative clean energy technologies is also influenced by the activities of **matching platforms**. We conclude that especially match-making events and online matching services can play an active role in creating a better functioning investment community.

Clean energy innovators face several issues when trying to raise capital for their ventures. Some of the main issues are intrinsic in nature since they originate from fundamental properties of the sector. Examples include too high technological, regulatory and commercial risk, too small venture capital funds and the lengthy time horizon for commercialising clean energy innovations. We conclude that these issues cannot be resolved by efforts to improve the functioning of the European investment community such as match-making, training and coaching. Instead, stronger interventions are required such as carbon taxes, public funding or regulation to ban competing (fossil fuel) technologies.

Meanwhile, several important issues exist that are transactional in nature, such as the innovator's lack of financial knowledge, the lack of a properly developed business plan and the investor's lack of technical knowledge. Furthermore, innovators tend to lack commercial and communicative skills and a network with the financial sector which is especially crucial for identifying business angels and family offices. We posit that these issues can be targeted by efforts to improve the European investment community because these issues do not stem from fundamental mismatches between investor preferences and the innovative venture's characteristics. Especially matching platforms would be well-positioned to contribute to overcoming these issues as they specialise in liaising between innovators and investors.

The efforts that matching platforms could take to overcome the transactional issues can be sub-divided into complementary services that directly address transactional issues and best practices to improve the existing match-making activities. We conclude that especially InnoEnergy already provides most of the complementary services that are required to overcome these issues, such as financial advisory, technology due diligence and training on soft skills. But also platforms such as Ecosummit, Slush and the High-Tech Venture Days offer some services that target pressing issues. Best practices for effectively facilitating investments in the sector are not always applied consistently, as several platforms set their

agenda, geographical and technical scope too broad. Tech Tour can be seen as the platform that applies the best practices most consistently as they invite a diverse set of investors, organise small, regional events and focus their events on a specific technology.

Overall, we conclude that the European investment community for innovative clean energy technologies can be improved by efforts to build a better functioning community. Existing initiatives like InnoEnergy could be further developed to meet unmet needs such as regional, technology-specific events that offer the most relevant complementary services and apply a focused agenda. Alternatively, new match-making initiatives could be launched for the technologies and regions that are most active, hereby providing a rapid, targeted stimulus to investments in these sectors.

Annex 1: Case studies

This annex includes the case studies that were prepared as input for the analyses in the main report and offer more detailed information on the experiences of innovators and matching platforms in the sector. The following case studies are included:

1. Aurelia Turbines (innovator)
2. Enervalis (innovator)
3. Skeleton Technologies (innovator)
4. Smart Hydro Power (innovator)
5. European Investment Advisory Hub (matching platform)
6. ETEQ Venture (matching platform)
7. Greencrowd (matching platform / equity crowdfunding)
8. InnoEnergy (matching platform / accelerator)

1. Aurelia Turbines

The company and its technology



Company: Aurelia Turbines was established in 2013 to commercialize a gas turbine technology developed over the last 30+ years by Lappeenranta University of Technology (LUT) in Finland. The company has around 25 employees (including LUT staff), each one with a minimum of 5 years of experience in high speed generator and/or microturbine industry. Four of the company's managers have a background in financial services / cleantech investments (min. 10 years).

Technology: Aurelia Turbines produces small gas turbines with an electrical output of 400kW and superior electrical efficiency of over 40 percent. The combustion processes have been designed so to accommodate not just natural gas, but an extensive range of fuels such as renewable fuels, bio fuels and other non-standard fuels. The gas turbines can be used to produce both heat and electricity. The technology's modular design allows for easy scalability and synergy with industrial processes, such as heat or process steam production. Its small size and world's highest partial load efficiency in the market makes it very well suited for decentralized power production applications, including in markets with growing electric power demand but lagging electric grid infrastructure. Besides the high efficiency, other features include oil-free operation, considerably lower maintenance costs, over 90 percent reliability rate, zero vibration and very low CO₂ emissions.

Year	Milestones in the history of Aurelia Turbines and its gas turbine technology
2013	Mr. Matti Malkamäki (current CEO of Aurelia Turbines) approached Lappeenranta University of Technology (LUT) with the suggestion to commercialize their innovative gas turbine technology. Following the development of a feasibility study, LUT agreed to the spin-off. Aurelia Turbines was founded and LUT transferred the IP rights for its technology to the company. LUT, through its investment arm Green Campus Innovations (formerly known as Lureco) remains an important shareholder of Aurelia until today.
2015	Feasibility study conducted and business plan developed with financial support from EU H2020: The project (10/2014-03/2015) focused on demonstrating the end-customer needs and expectations, sales network, cost structure and overall financial planning of the company.
2016	Proof-of-concept prototype built
2017	Beginning of low volume production starting in April 2017

Market: The technology seems well positioned to benefit from a massive global small gas turbine market, particularly in Central Europe and Russia. Aurelia Turbines states that it currently holds letters of intent for the delivery of around 250 turbines. As of January 2017, four contracts have been signed. Based on these commitments, the company expects sales of 100 M€ in the first 3 years of delivery. After a slight delay in proof-of-concept due to technical challenges, first components have now been ordered and production is set to start in April 2017.

Financing history of the reviewed technology

TRL	Date	Amount (rounded)	Type of funding	Investor / Financial institution / etc.
1-2	2013	EUR 10 000	Equity	Private investors (Matti Malkamäki)
1-2	2013	EUR 17 000	Grants	ELY: Centre for Economic Development, Transport and the Environment Ladec (Lahti Region Development)
1-2	2014	EUR 600 000	Equity	Private investors (Green Campus Innovations (formerly known as Lureco) and others)
1-2	2014	EUR 1 000 000	Grants / loans	Tekes - Finnish Funding Agency for Innovation Ladec (Lahti Region Development)
3-4	2014	EUR 50 000	Grants	EU H2020
3-4	2015	EUR 550 000	Equity	Private investors
3-4	2015	EUR 130 000	Grants	ELY: Centre for Economic Development, Transport and the Environment Nordic Project Fund (Nopef)
5-7	2016	EUR 1 410 000	Equity	Private investors
5-7	Sep, 2016	EUR 580 000	Grants / loans	Tekes - Finnish Funding Agency for Innovation ELY: Centre for Economic Development, Transport and the Environment

Investment history and matchmaking mechanisms: The company's first investors were Mr. Malkamäki and Green Campus Innovations (formerly known as Lureco). Once these investors were settled, discussions started with other investors. Today, Aurelia has a total of 33 shareholders, including 10 family offices, several high net worth individuals and one Venture Capital Fund (Cleantech Invest). Aurelia Turbines states that these investors were identified through the following channels:

Some of the investors had successfully invested in some of LUT's ventures before.

Other investors heard of the investment opportunity through "word of mouth", i.e. through personal communication with other investors.

The company has never taken part in any business acceleration program or searched for funding through crowdfunding or professional matchmaking services.

Ownership: The current ownership structure of Aurelia Turbines is as follows: Pontoon Ltd (Matti Malkamäki and his wife) 45.2%, Green Campus Innovations 28.9%, Capillary Oy 13.5%, Cleantech Invest 4%, LUT researchers, angel investors and others 8.4%. Aurelia Turbines does not currently have any corporate investors.

Challenges for obtaining funding

Complicated technology, lack of demonstration

The technology itself posed a challenge for finding investors since it was relatively complex, and before the prototype was built, demonstration of technology was not available. Substantial funding had to be provided before the technology was proven in a real environment.

Slow-down of the cleantech investment environment

The company is negatively affected by the general decrease of venture capital investments into cleantech that was caused by large financial losses in the past.⁶⁵ According to Mr. Malkamäki, CEO of Aurelia Turbines, it is currently very hard to find venture capital investors willing to provide funding for the early stages of technology development. Rather, they are more inclined to invest at latter stages.

Inadequacy of matchmaking events

According to Mr. Malkamäki, “*out of 100 investors one will invest*”. Yet, he has noticed that particularly pitching or matchmaking events addressing various sectors in parallel, often suffer from low investor participation rates. Moreover, many matchmaking events involve only VC funds, rather than allowing for a more diverse crowd of investors (including, for example, family offices and high net worth individuals). For Aurelia Turbines, such events have generally not led to successfully matchmaking.

Inadequate consideration of demonstrated market potential

Mr. Malkamäki notices another issue that does not necessarily affect a company’s access to funding but rather reduces the chance that it will achieve successful commercialisation of its technology. According to his opinion, many innovators and investors have very limited understanding of markets and even less for the route to access those markets as a start-up. They are often content with market studies showing that there are potential markets for the technology to be developed. Yet, investors do not usually require such market potential to be proven through letters of intent, purchasing agreements, identification of first distributors, etc. Such information would help stabilize the cleantech market and enhance credibility of companies with clear sales and marketing capacities.

Key success factors for funding

Cooperation with Lappeenranta University of Technology

Investors are generally more inclined to invest into proven and low-risk technologies. Many start-ups, however, cannot obtain funding to prove their innovations. Cooperation with universities can help enhance the risk profile of such ventures. Through their clear focus on innovation research and testing in a more risk-tolerant environment, universities allow for technologies to be tested. Hence, a close partnership with an academic institution generally brings credibility to the technology under development. In the case of Aurelia Turbines, cooperation with LUT has surely to a certain degree compensated for the lack of a functioning prototype until relatively late in the project.

⁶⁵ See, for example: Gaddy, Sivaram and O’Sullivan (2016)

Demonstrated large market potential

What has also certainly worked favourably for securing the technology funding was the sheer market size and potentially large sales volume if the technology were successfully developed, compensating for high risks. Aurelia Turbines was able to demonstrate the market potential for its technology through signing letters of intent with a large number of potential customers. Moreover, it began very early with scouting for potential distributors and sales partners. Aurelia Turbines benefited from the vast business networks that its management team members had built during previous occupations in relevant industries.

Targeting the right investors

Aurelia Turbines has only one VC investors but over ten family offices and individual investors which they attracted through the network of the LUT and “word of mouth”. According to the company’s experience, this type of investor is more apt for funding the demonstration and pre-commercial phase of technology development as they often have more diversified portfolios and more direct relations with local companies, hence increasing their willingness to take risks. Once the product is demonstrated and on the market, it will be easier to attract large VC funds for latter founding rounds.

Constant marketing of the technology

Aurelia Turbines was able to obtain funding from several public funds. Moreover, the company has participated in a large number of pitching events and has ranked highly in several awards (Nordic Cleantech Open Top 25 2014/2015, Rushlight Awards 2015/2016 Commended, Top 30 Most Promising Energy Startup in Europe 2016, etc.). These factors have likely increased the visibility of the company to potential investors.

Experienced management team with large business networks

Aurelia Turbines management team and employees all have previous experiences in the industry, either through research at LUT or through prior occupations in the gas turbine industry. This background provides the company with an extended network in the cleantech sector across Europe and has facilitated finding both sales partners and potential customers.

Additional support that would facilitate investments

Mr. Malkamäki suggests the following measures to increase investment volumes for the cleantech sector:

- Member states of the European Union should allow investors to deduct investment capital from their tax base in case that the capital is lost. This is currently standards in the USA.
- It is necessary to strengthen collaboration between universities and start-ups so that more entrepreneurs or innovative companies have access to well-equipped testing environments.
- Matchmaking events should be kept small and with focus on specific technologies or industries. Localized events involving not only large, international VC funds but also family investment offices and high net worth individuals will likely be more successful than cross-regional and cross-sectoral approaches.
- It might be helpful to provide young companies with support for identifying concrete sales opportunities and partners prior to the actual market introduction of their technologies.

Conclusions

Aurelia Turbines was able to find investors through the professional networks established by the Lappeenranta University of Technology and by the company's management and employees. Pitching events, participation in awards and financial support from public entities have helped to further increase their visibility and credibility but have not led to concrete matchmaking. Additional public or private support services can be beneficial if they help young companies with reducing the risks of technology development rather than with the scouting for investors. Particularly matchmaking with universities and sales partners will be helpful.

Sources

The majority of information was obtained through a written survey completed by Aurelia Turbines (February 2017) as well as through a telephone interview with the company's CEO (February 2017).

Additional online sources include:

Aurelia Turbines (2014): Company presentation

http://ecosummit.net/uploads/eco14_081014_1045_mattimalkamaki_aureliaturbines.pdf

Aurelia Turbines (2015): Company presentation

http://www.paijat-hame.fi/wp-content/uploads/2015/09/EU_rahoitusinfo_malkamaki_150916_aurelia_ph_liitto.pdf

Cleantech Scandinavia (2015): Pitching Cleantech Companies 2015

<http://ccd.cleantechscandinavia.com/wp-content/uploads/2015/12/PITCHING-CLEANTECH-COMPANIES-2015.pdf>

CORDIS (2016): Aurelia Turbines - proof of concept for very high efficient small gas turbine

http://cordis.europa.eu/project/rcn/194741_en.html

FIM (26.01.2017): Company analysis - Cleantech Invest

<https://www.fim.com/globalassets/media2/nakemys/yhtioanalyysit/cti-company-analysis-26.1.2017.pdf>

Gaddy, B., Sivaram, V., O'Sullivan, F. (2016): Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation. MIT Energy Initiative Working Paper.

<https://energy.mit.edu/wp-content/uploads/2016/07/MITEI-WP-2016-06.pdf>

Global Newswire (31.08.2015): Half-year review 1 January to 30 June 2015 (unaudited)

<https://globenewswire.com/news-release/2015/08/31/764458/0/en/Half-year-review-1-1-30-6-2015-unaudited-Strong-revenue-growth-in-Cleantech-Invest-portfolio-companies.html>

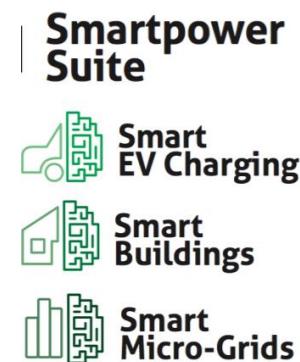
2. Enervalis

The company and its technology

Enervalis

Company: Enervalis was founded in 2013 in Limburg, Belgium. The company has 12 employees. The management board is comprised of four people, each with 15-30 years of professional experience. Research and development staff has 5-15 years of work experience.

Technology: Enervalis is a smart grid software company that builds the operating system of the future energy networks to enable mass market energy services. Its cloud-based software (SmartPowerSuite) allows for efficient organization and management of all available energy supplies, storage and demands to optimize energy streams for electrical vehicles (EVs), buildings and micro grids. It offers production & consumption forecasting for optimal green-energy utilization, wholesale energy market integration for the lowest energy purchase cost and extensive interoperability, security, app & user interface layers, which can all be combined as needed. The software is designed to provide cost reductions as well as extra upside revenues from energy assets.



Year	Milestones in the history of Enervalis
Feb 2013	Enervalis founded
Apr 2013	Start of participation in KIC InnoEnergy Highway programme
May 2013	First pilot developed
Feb 2014	First pilot developed with a commercial customer (collaborative effort)
Jul 2014	InnoEnergy project: BEEST (Building EE Management & Smart Grid Integration Tools)
Dec 2014	First commercial recurring revenue from the customer with whom the pilot was developed
Jul 2015	H2020 project granted: REnnovates (Flexibility Activated Zero Energy Districts)
Sep 2015	Enervalis transformed into a legal entity; InnoEnergy becomes formal shareholder (rather than investing additional money, this shareholder position was based on the monetary contributions that Enervalis had obtained through the InnoEnergy Highway program)
2015	First commercial products sold (limited scope and rather in beta stage)
2016	H2020 project granted: WISER (Wide-Impact cyber Security Risk framework)
2017	Funding for scale-up of Enervalis secured (financial closure in March 2017)

Market: In 2016, Enervalis' revenue amounted to €860.000. It forecasts large market potential for its products. This forecast is based on both internal information (letters of intent, projects planned by Enervalis and partners) and external information (market analysis reports, e.g. by Bloomberg New Energy Finance).

Participation in research projects

- 2014: BEEST (Building Energy Efficiency Management & Smart Grid Integration Tools). Enervalis works on technical software enable for algorithms as well as concrete pilot implementation.
- 2015: In the REnnovates project, Enervalis will deploy and further extend its SmartPowerSuite operating system with a high focus on Smart Micro Grid application. Enervalis expects that this project will become a blue-print for how sustainable, green residential buildings can be optimally managed and actually form cost-effective and scalable cornerstones of the distributed next generation energy networks.
- 2016: The WISER project consists of a group of companies with strong expertise in cybersecurity. The goal is to build a cybersecurity risk management platform which goes beyond the current available products. In 2016, Enervalis was selected to replace a partner in this project. Enervalis contributes to validate and extend the platform specifically towards the smart grid energy field.

Cooperation with market stakeholders

Enervalis entered in to strategic cooperation with ABB Benelux in 2015/2016. It had considered cooperation with other industry partners as well (e.g. ENGI, EDF, Schneider, Siemens) but perceived ABB to be the most appropriate partner due to the complementarity and strategic fit of its products towards the multinational's portfolio. ABB Benelux hopes to find synergies with Enervalis' software systems which will make a real difference in terms of costs and efficiency for smart grid applications.

Moreover, Enervalis works with other municipalities and companies (e.g. Mitsubishi) in the Electric Vehicle, Construction and Utilities industries on both sides of the Atlantic and beyond.

Financing history of the reviewed technology

Date	Amount (rounded)	Type of funding	Investor / Financial institution / etc.
Sep 13 - Sep 16	EUR 0,2 million	Personal funding	Founder
Sep 14- Sep 28	EUR 1,3 million	Grants	3 EU funded projects (BEEST, REnnovates, WISER)
Mar 17	> EUR 4 million	Equity	ABB: Swiss company specialized in power and automation technology and robotics Nuhma: Investment vehicle of the Limburg municipalities (Belgium) for investing into sustainability, energy and innovation LRM: Investment company that promotes innovation-based economic growth in Limburg
At its foundation, Enervalis' software was approximately at TRL 1-2 (before proof of concept). In March 2017, when the first funding round was closed, some of the company's products were at TRL 9 (commercial exploitation) while other components and ideas were at lower TRLs (1-7).			

Investment history and matchmaking mechanisms

For the series A investment round closed in March 2017, Enervalis provided over 20 potential investors with the phone numbers of its customers so that the investors could obtain feedback on the marketability and prospects of Enervalis and its products. According to Mr. Lodeweyckx, these business contacts provided very positive feedback and thereby strengthened the company's credibility. The success of this investment round was hence built essentially upon Enervalis' previous involvement with real customers.

The three final investors were among the 20+ investors contacted by Enervalis. Enervalis, ABB and Nuhma are all involved in smart residential housing projects. Enervalis met representatives of both corporations at networking events. In the following, they started scoping joint project opportunities, with both companies interested in investing in Enervalis' software solutions. LRM was identified as co-investor due to its geographical focus on Limburg and its mandate as regional sustainable development fund.

Mr. Lodeweyckx states that he had thought about obtaining additional capital through crowdfunding but thinks that the company's product is too complex for the broad audience organized through crowdfunding platforms.

Challenges for obtaining funding

Complicated, unproven technology / Lack of investors' market knowledge

Enervalis thinks that the complexity and unproven value of its model reduces attractiveness for many investors. Mt. Lodeweyckx notes that potential investors did not understand the overall evolution of the energy system and the large commercial opportunity for Enervalis' technology. In-depth understanding of the energy sector is hampered by the speed of technology development. At the same time, European VC investors are perceived to be risk relatively averse, for example compared to US-American investors.

Lack of network to prove investment credibility

When founding Enervalis, founder Stefan Lodeweyckx and his team had no previous professional experience in the energy sector and thus did not have a business network. This lack of established industry contacts reduced the visibility of Enervalis among investors and affected its attractiveness.

Inefficient use of public money through acceleration programs

Experiences made by Enervalis suggest that public money (e.g. money provided by EIT through InnoEnergy) is not used as efficiently as possible. This is illustrated by the following observations:

- The InnoEnergy Highway program supports its start-ups through facilitation of services (e.g. renting out algorithm specialists) rather than direct capital contributions. According to Mr. Lodeweyckx, some of these services are overpriced and could be organized more cheaply by the start-up itself.
- Matchmaking events with potential industry partners are often attended by the companies' strategy managers rather than by those who are directly involved in operational business and who have concrete ideas (and/or decision power) for business innovation. Such matchmaking is not likely to be successful as it does not provide an appropriate set up for developing concrete cooperation scenarios.
- Another challenge is related to innovation projects. Enervalis has made the experience that research institutions mainly participate in such projects in order to finance their researchers, not to develop commercially viable projects. Many innovation projects are thus "doomed to fail". Yet, Mr. Lodeweyckx also notices that this challenge has been addressed by the H2020 programme which places more emphasis on marketability than the previous FP7 programme.

Key success factors for funding

Demonstrate marketability and proof-of-concept

Marketability is one of the most important factors for attracting investors. Start-ups should thus focus on starting the first commercial proof-of-concept projects and generating commercial incomes in order to demonstrate that their products / services are being requested by market participants.

The following success factors all contribute to creating visibility and credibility.

Constant networking and high personal dedication

According to Mr. Lodeweyckx, the motivation of the founder(s) and CEO to engage in networking and to do so persistently and over a long period are important success factors for fundraising. Rather than hoping to be “found” by an investor, start-ups should actively engage in networking activities. At the same time, founders need to have strong belief in the vision with which the company was founded (or the project initiated) and the courage to oversell their ideas and capabilities at the beginning in order to be able to compete with the vast number of “rival” energy companies.

Collaboration with established companies and research institutes

According to Mr. Lodeweyckx, participation in long-term, well-funded research projects and commercial involvement with large established companies contribute to building a positive track record for the company and widening its business network. It also illustrates the company’s ability to close and comply with contracts with a multitude of different partners. Cooperation with ABB is particularly beneficial for Enervalis as it has an interest in fast technology development. Additionally, ABB also features the required network to identify further commercial opportunities for Enervalis.

Flexible adaptation of the business model to market demand

Marketability is not inherent to most energy innovations. While Enervalis’ vision and mission have never changed, its value proposition has changed a lot and is still changing in line with new influences and feedback from customers and partners. With the support of such stakeholders, Enervalis hopes to develop products that have strong market value.

Additional support that would facilitate investments

Mr. Lodeweyckx suggests the following measures to increase investment volumes for the cleantech sector:

- A virtual network could be created to facilitate contact with corporate partners (e.g. energy suppliers, building companies) and, more specifically, with the “operational people” who have the vision and responsibility for initiating innovation within their company. Such a network could be an amalgam of LinkedIn with the InnoEnergy network. Lean selection criteria would help select the right contact persons.
- Europe should provide co-funding to corporate investors and potential customers who are willing to invest and engage in early stage pilot development. This could be combined with the first idea - a type of network should be formed with potential customers which then receive small capital injections from the EU.
- Rather than paying for external services, business accelerators such as InnoEnergy could give the money directly to start-ups who then organize the required services themselves. Accelerators could accompany

this process and give guidance, e.g. through regular calls. However, this approach is relevant mostly for “standard” (e.g. software-based) services. Other, more specific and capital-intensive assets or services are difficult for start-ups to access, thus making support by accelerators such as InnoEnergy a valuable contribution to the growth of energy innovators.

- Focus of any business support should be on getting a proof-of-concept ready, even if it is just small or covers only part of the system under development.

Conclusions

Enervalis started off as a company with almost no connections to the energy industry. The founding team put great effort into networking, particularly with potential customers. Out of the large number of potentially interested investors, those with the closest linkages to Enervalis - technology-wise and geographically - ultimately decided to take the step and invest. Enervalis’ participation in research programs has further increased its industry network and established credibility in the eyes of established companies. Participation in the InnoEnergy Highway programme was helpful in the way that it also increased visibility but, according to Mr. Lodeweyckx, the money spent on this programme could be invested more successfully if it was injected directly into the start-ups rather than in (over-priced) services for start-ups.

Sources

The majority of information was obtained through a written survey completed by Enervalis (March 2017) as well as through a telephone interview with the company’s CEO Stefan Lodeweyckx (March 2017).

Additional online sources include:

KIC InnoEnergy (2015): Software developer Enervalis to collaborate with ABB Benelux on smart grid delivery
<http://www.innoenergy.com/software-developer-enervalis-to-collaborate-with-abb-benelux-on-smart-grid-delivery/>

Enervalis (2015): Creating more value with Energy
<http://tbb.innoenergy.com/wp-content/uploads/2015/11/Enervalis.pdf>

REnnovates: Enervalis, <http://rennovates.eu/portfolio-item/enervalis/>

European Commission: REnnovates, http://cordis.europa.eu/project/rcn/198375_en.html

European Commission: WISER, http://cordis.europa.eu/project/rcn/194847_en.html

InnoEnergy: BEEST, <http://www.innoenergy.com/innovationproject/our-innovation-projects/beest/>

3. Skeleton Technologies

The company and its technology



Company: Skeleton Technologies was founded in 2009 by Taavi Madiberk and Oliver Ahlberg, together with two other Estonian researchers developing the technology. Skeleton Technologies develops and manufactures graphene-based ultracapacitors and energy-storage systems. The company

has two facilities: Skeleton Technologies OÜ, near Tallinn, Estonia, responsible for R&D and pilot production; and Skeleton Technologies GmbH in Grossmöhrsdorf, Germany, where production and sales are located.

Technology: Ultracapacitors are a novel energy storage technology that offers high power density, almost instant recharging and very long lifetimes. Ultracapacitors have been in development for well over a decade but the technology has developed rapidly in the recent years. This development has been driven by advances in nanomaterials, the electrification of infrastructure and industry and increased concerns around fuel efficiency. Ultracapacitors are now delivering significant economic benefits across a wide range of markets including motorsports, automotive, aerospace, heavy industry, heavy transportation, maritime, and renewables and grid.

Year	Milestones in the history of Skeleton Technologies and its ultracapacitor technology
2009	Skeleton Technologies founded
2010	First prototypes developed
2011	First contract with European Space Agency gives major boost to development efforts
2012	First commercial product series produced
2013	UP Invest becomes the first financial investor
2013	First full ultracapacitor-based system delivered
2014	New Estonian manufacturing facility opened for small-series production
2016	High volume production starts with 500 000 cells/year capacity
2017	High volume production facility launched in Germany with 4 million cells/year capacity

Market: According to own statements, Skeleton Technologies holds the technology leadership position in the ultracapacitors market as its ultracapacitors deliver twice the energy density and four times the power density offered by other manufacturers. With the opening of the new production facility in Germany, Skeleton Technologies will be able to produce up to 4 million ultracapacitors annually. Current customers range from the motorsport and automotive to the aerospace sectors, including global engineering companies, the European Space Agency and several Tier 1 automotive manufacturers. Skeleton Technology's most relevant competitors in the market are Maxwell Technologies, Ioxus and Nesscap.

Financing history of the reviewed technology

One of Skeleton Technologies' most important customers and financial contributors is the **European Space Agency (ESA)** with which the company has signed three research and sales contracts in 2011, 2015 and 2016. First sales to ESA are planned for the year 2020 or later.

Date	Amount	Type of funding	Investor / Financial institution / etc.
2010	€ 0,28M	Grant	Participation in “HESCAP” (EU-funded project on new generation, high energy and power density supercapacitor-based energy storage systems, 2010-2013)
2012	€ 0,19M	Grant	Participation in “e-Gotham” (EU-funded project aimed at developing a Sustainable-Smart Grid Open System for the Aggregated Control, Monitoring and Management of Energy, 2012-2015)
	€ 0,36M	Grant	Implementation of the “Li-Cap” project with support of Archimedes Foundation Estonia and European Structural Funds
	€ 0,60M	Grant	Grant from Enterprise Estonia (one of the agencies managing the European Structural Funds) for development of the Ultracapacitor 2.0 product line
	€ 0,13M	Grant	Participation in “I3RES” (EU-funded project aimed at Smart Network Management Integration of large scale RES, 2012-2015)
2013	€ 3,10M	Production Equipment Subsidy	Sächsische AufbauBank
2013 -2016	€ 13M	Equity	UP Invest, Harju Elekter, Continuum Capital, FirstFloor Capital
2014	€ 0,56M	Grant	Implementation of the “Fully Integrated ICT Platform for Operational Management of Ultracapacitors” project (funded by EEA Grants - Norway Grants; 2014-2016)
	€ 0,16M	Grant	Estonian subsidy scheme for high-income employees
2015	€ 4,40M	“Soft Equity”	Participation in “UCGEN3” (InnoEnergy innovation project on next generation ultracapacitors with significantly higher energy and power density). InnoEnergy does not obtain equity shares. If the company is successful as defined by the contract terms, the investment will be re-paid through revenue sharing.
	€ 2M	Investment loan	Swedbank AS
2016	€ 2,49M	Grant	EU COM “SME Instrument” (Skeleton Technologies qualified for two phases (1: Feasibility Study, 2: Innovation Project)
	€ 15M	Quasi Equity Facility	European Investment Bank
Total	€ 42,66 million		
<i>When the company was founded, its technology was at TRL 3-4. It is now at TRL 8-9.</i>			

Investment history and matchmaking mechanisms: In the first years, Skeleton Technologies funded technology development with support of various research grants. The company benefited from the fact that two of its founding members are Estonian researchers with very good understanding of the opportunities for research funding. Other than that, the company's founders did not have any particular fundraising experience or skills.

The “push” for cooperation with the European Space Agency came through a large space systems integrator company which aimed to integrate ultracapacitor technology into telecom satellites. A key person of this company had heard of the Estonian research team previously and proactively approached Skeleton Technologies.

Further funding opportunities were then searched within Estonia, the home country of Skeleton Technology's founders, as this approach promised to prevent language barriers and create benefits through similar understandings of local business culture. In 2013, capital for production equipment was obtained with support from the Estonian government which organized a state delegation visit to Saxony, Germany. The company's first financial investor (UP Invest) and its corporate investor (Harju Elekter) are also Estonian companies.

Skeleton Technologies has secured funding from two EU sources - the SME Instrument and the EIB. The company identified these opportunities itself through online research. It is currently in the process of identifying further public financial instruments, particularly on the EU-level and in Germany.

Challenges for obtaining funding

Learning the basics of investor expectations

When founding the company, the founders did not have any particular skills in fundraising besides through research grants. Some of the key questions that they struggled with included: What are the projected production volumes, which are considered attractive, but not “completely mad”? What is perceived as an accepted production ramp-up period? What is an attractive but realistically obtainable cost of goods sold margin?

Learning negotiation language and dynamics

Finding funding is essential for securing the survival of young start-ups. In that situation, many investors tend to want to “dictate” the terms under which they invest. According to Skeleton Technologies, “the greener and hungrier the company looks and feels, the worse are the terms offered” because the potential investors get the impression that the company is desperate for funding. Behaving accordingly and not accepting any offer (Skeleton Technology's founders actually walked away from some investors whom they perceived as too demanding) shifts the “anchor point” for the negotiations.

Key success factors for funding

Building on public funding

A definite key success factor is combining private funding with public funding. In addition to direct financial support that increases the company's liquidity and speeds up technology development, public funding also provides a “seal of approval” that reduces the risks perceived by potential investors. Skeleton Technologies exhausted many public funding opportunities, both in Estonia and abroad. Each of the financing rounds included both public funding for well-defined R&D activities and investor contributions. Skeleton Technologies'

Programme Director, Mr. Egert Valmra, who was interviewed for this case study, considers the contract with ESA, the funding provided by InnoEnergy through the UCGEN3 innovation project as well as the participation in the EU SME Instrument to be very decisive for the company's success. This financial history even helped in securing the Quasi Equity Facility provided by the EIB.

Building internal investor-relation through proactive and intensive search for investors

The confidence and the competence of the core investor-relations team (particularly the CEO, CFO and COO) are key success factors for fundraising. Important skills to be learned include presentation (ability to present the product and vision in both short (3 minute) public pitches and longer, closed-door pitches directly to investors) and negotiation. Mr. Valmra emphasises that these skills can only be learned with practical experience, through trial and error. As Skeleton Technologies contacted and met a very large number of potential investors, e.g. during networking or pitching events or consultations with individual investors, it was able to build its strengths over time and with feedback from the investors. Further insights were won when the company engaged external consultants to support its fundraising efforts. Even though no specific investments were attracted, Skeleton Technologies was able to further refine its competencies and "learn the tricks"⁶⁶.

According to Mr. Valmra, the best way to ensure deals with investors is to try to facilitate as many meetings as possible. Matchmaking events are important platforms for meeting investors. Skeleton Tech committed heavily to building its network of contacts through participation in events such as the Advanced Automotive Battery Conference. Moreover, it participated in networking activities and pitching events organised by or facilitated through InnoEnergy. Approximately in 2014, Skeleton Technologies started focusing their fundraising activities on (potential) customers as they realized that these are also potential investors and partners.

Building the support team

Mr. Valmra deems it critical for the "investor relations team" - typically composed of the CEO, CFO and COO - to be supported by a team of five to six employees who do the "grunt work" - from background analyses, writing business plans and constantly updating the financial models to compiling presentations, draft the funding proposals and preparing individual meetings. Based on this realization, Skeleton Technologies hired a professional designer and a technical writer in 2015 to enhance its in-house capacity for fundraising.

Cooperation with established partners

Skeleton Technologies conducts development projects in cooperation with a multitude of corporations, including NXTech AS (Norwegian high-tech design and engineering company), Adgero (French transport technology developer) and others.

Additional support that would facilitate investments

Mr. Valmra suggests that at least one management team member needs early experience in fundraising. This can be supported through cooperation with fundraising professionals or experienced start-up managers but essentially needs to be built over time.

⁶⁶ Yet, it should be noted that such service providers can be difficult to attract if, similar to investors, their payment depends on the financial success of the company (i.e. success-based fee). In this case, the start-up has to have a convincing story and proof of good market outlook in order to convince the service provider to become engaged.

Conclusion

Skeleton Technologies started its financial history with research grants and investments by Estonian companies. These funds could be obtained most easily with the company's existing skills-base, as it was founded by a team of Estonian researchers. As over time the network of large research and development partners as well as potential customers grew, Skeleton Technologies was able to enter large-scale EU support schemes (SME Instrument, EIB) and obtain a commercial loan (Swedbank). Public funding has played a key role in building the company's profile, developing its technology and increasing liquidity. Additionally, the company has benefitted greatly from building the presentation and negotiation skills of its investor relations team and support team.

Sources

The majority of information was obtained through a written survey completed by Skeleton Technologies (March 2017) as well as through a telephone interview with Mr. Egert Valmra (Programme Director, April 2017).

Additional online sources include:

[EASME \(2016\): A step into the future - Skeleton Technologies raises €13 million for its graphene ultracapacitor](https://ec.europa.eu/easme/en/news/step-future-skeleton-technologies-raises-13-million-its-graphene-ultracapacitor)
<https://ec.europa.eu/easme/en/news/step-future-skeleton-technologies-raises-13-million-its-graphene-ultracapacitor>

e-GOTHAM: Sustainable-Smart Grid Open System for the Aggregated Control, Monitoring and Management of Energy (2012-2015); <http://ses.jrc.ec.europa.eu/e-gotham>

Energy Saxon: Skeleton Technologies company presentation (2016)
http://www.energy-saxony.net/fileadmin/Inhalte/Downloads/News/2016/160831_company.pdf

Fully Integrated ICT Platform for Operational Management of Ultracapacitors project
<http://eeagrants.org/project-portal/project/EE07-0007>

I3RES: Smart Network Management Integration of large scale RES (2012-2015);
<http://ses.jrc.ec.europa.eu/i3res>

Skeleton Technologies: Company presentation (2017)
<https://www.skeletontech.com/about>

[Spotfolio \(2016\): KIC InnoEnergy backs Skeleton Technologies' graphene ultracapacitors with €4m investment](https://spotfolio.com/de/2016/01/28/kic-innoenergy-backs-skeleton-technologies-graphene-ultracapacitors-with-e4m-investment/)
<https://spotfolio.com/de/2016/01/28/kic-innoenergy-backs-skeleton-technologies-graphene-ultracapacitors-with-e4m-investment/>

The Economist (2016): Manufacturing ultracapacitors. An Estonian firm gives electricity storage more oomph.
<http://www.economist.com/news/science-and-technology/21708656-estonian-firm-gives-electricity-storage-more-oomph-manufacturing>

ZDNet (2015): Skeleton's key: The Estonian startup that wants to be the model ultracapacitor maker.
<http://www.zdnet.com/article/skeletons-key-the-estonian-startup-that-wants-to-be-the-model-ultracapacitor-maker/>

ZDNet (2015): Skeleton's key: The Estonian startup that wants to be the model ultracapacitor maker

<http://www.zdnet.com/article/skeletons-key-the-estonian-startup-that-wants-to-be-the-model-ultracapacitor-maker/>

4. Smart Hydro Power

The company and its technology



Company: Smart Hydro Power Ltd. is a German private company, majority-owned by its founders, Ines and Karl Kolmsee.

Technology: Smart Hydro Power specializes in design and implementation of off-grid, renewable resource-based electric energy systems intended for rural applications. The core module of these energy systems is the proprietary “zero-head” or “in-stream” turbine which takes advantage of water kinetic energy, rather than potential

energy. This feature eliminates the need for water dams, making the technology simpler, more reliable and price-competitive. At the same time, it dramatically increases its application scope in terms of stream topography. A further feature boosting the turbines’ application range is high flexibility in terms of water velocity for power generation. This technology provides around the clock, base-load power, as opposed to other technologies such as solar photovoltaic. Currently, two turbine models are available - a river bed-installed and an anchored, floating one. A third model is being developed.

Most of Smart Hydro Power’s projects are not limited to the turbines, but feature other components that make up an off-grid, uninterruptible power system (UPS). The power supply can be complemented with a photovoltaic module, and energy storage can be provided by a battery pack. The balancing of the supply and demand, monitoring, output modeling, load management, tariffing, and control of the power supply modules takes place in a proprietary Smart Electrical Management System, which can function as interconnector to the grid. The company also supplies irrigation systems and backup-power fuel generators.

Year	Milestones in the history of Smart Hydro Power
2010	Founding of Smart Hydro Power
2011	First prototype finalized, first installation in Peru
2014	Turbine market ready, first relevant revenues generated
2015	Introduction of own distribution system
2015	€ 750 000 revenue
2016	First Indian project
2017	First turbine park grid connected

Market: The company has so far sold over 40 turbines and implemented 27 electric power systems on five continents. Its main markets are rural areas in India, South America, Sub-Saharan Africa and South-East Asia.

Financing history of the reviewed technology

TRL	Date	Amount and type	Investor name	Investor type
3-5	Aug 2010	EUR 250 000	Grant	Government of Bavaria
	2010	(amount unknown)	Loan	Kolmsee Family
	Dec 2010	EUR 500 000	Convertible loan	High-Tech Gründer Fonds (HTGF): joint venture of the German Federal Ministry of Economics and Energy, the KfW Banking Group, and some of Germany's most high profile corporations. It provides seed, early stage and later stage venture investments.
6-7	May 2011	EUR 700 000	Changing loan to equity	Loans provided by HTGF and Kolmsee family were changed into equity.
6-7	May 2011	EUR 2 000 000	Equity	eCapital: German private capital venture with capital from institutional investors such as banks, insurance companies, big German family offices. It focuses on venture capital and buy-outs, principally in cleantech, software & IT, industry 4.0, new materials
7-8	2013	EUR 1 000 000	Equity	eCapital KfW: German government-owned development bank. It typically provides loans, equity and mezzanine financing.
8	2015	EUR 1 050 000	Equity	Kolmsee family eCapital and KfW Private individual business angels

Investment history and matchmaking: In its founding year, Smart Hydro Power obtained a grant from the Bavarian government. It was able to match this grant with a mix of private funding (Mr. and Mrs. Kolmsee) and a convertible loan provided by the HTGF. Smart Hydro Power then introduced its business plan to a number of potentially interesting investors that they identified together with the HTGF. eCapital was not among these investors but learned about Smart Hydro Power from other investors and proactively approached the company.

Despite early piloting and successful installation of the technology, Smart Hydro Power missed its revenue targets in 2014/15. Yet, the company's investors recognized the technology's marketability and agreed to contribute to another funding round if additional investors would enter. Smart Hydro Power decided for two business angels who had already approached the company before and had shown interest in its technology.

Smart Hydro Power is currently looking for investors to accelerate their expansion into their core markets in Latin America, East Africa and India. Their search will focus on business angels or strategic corporate investors. The search is conducted through the company's local industry networks.

Ownership: Ines and Karl Kolmsee 36 %, eCapital 35%, KfW 12%, HTGF 12%.

Challenges for obtaining funding

Venture Capital not the most appropriate financing mechanism for hardware development

Mr. Kolmsee is of the opinion that VC might not be the most adequate financing mechanism for Smart Hydro Power's hardware innovations. In hindsight, it seems that the development of its capital-intensive technology could have been supported more efficiently and more quickly by corporate investors, as these often provide not only larger sums of capital but are also interested in fast technology development to advance their own operations and thereby offer an easy market entrance. Support from the two business angels proved to be quite effective, as both have clear expertise in relevant industries (rural electrification, financing technology innovation in Africa) and more actively contributed to building the company's sales network.

Mr. Kolmsee notes that, nowadays, it is more difficult to obtain venture capital for hardware based clean energy technologies in seed state. On the one hand, VC funds shifted their focus away from hardware towards software development and other industries. On the other hand, they are no longer perceived to be as actively involved in the early stages of technology development as before. A strong focus on matchmaking with and by VC funds might thus not lead to the expected financing for clean energy technologies.

Yet, finding the right type of investors and funding channels can be a lengthy process that requires that founders have a clear understanding of their business models and overall capital requirements. Mr. Kolmsee suggests that young startups might want to consider funding from friends and family in order to have enough time to select the right investors.

Target markets not aligned between innovators and investors

Smart Hydro Power has access to the investor networks of the HTGF (specifically through its Family Day, a regular matchmaking event) and eCapital (through its "Unternehmertag" (company day) for portfolio companies). These meetings have so far shown little result, as the investors organized through these networks are not specialized in funding technologies that are destined for developing country markets.

Key success factors for funding

Early prototyping and demonstration of market potential

The first prototypes were installed in real environments as early as 2011, one year after the founding of the company. This was done to showcase the functionality and sales potential of the technology to investors. Already in its first years, Smart Hydro Power received a multitude of purchase enquiries from customers across different companies and continents. It was able to attract these potential customers through its socially and economically convincing business case, supported and marketed through various activities to boost visibility.

Activities to increase visibility and credibility

Smart Hydro Power participated in several competitions and won a number of high-profile awards, each of which was accompanied by far-reaching media campaigns. Moreover, Smart Hydro Power is regularly featured

in German and international media as an exemplary company for their state-of-the-art technology and positive social impact. This increases the company's visibility and attracts a multitude of potential customers.

In the target markets, Smart Hydro Power cooperates with local NGOs, foundations and governments to increase the credibility of the company to potential new customers. These contacts were established incrementally, with personal contacts and recommendations being the key success factor. The involvement of the German KfW Bank and HTGT (High-Tech Gründerfonds) has shown to increase the trustworthiness of the project in the eyes of foreign customers and governments. Nevertheless, there is reason to believe that demand for Smart Hydro Power's technology would be high even without such public support, simply because the demand for small-scale, low-cost renewable energy systems is extremely high and growing.

Seeking support from within target countries and industries

Smart Hydro Power greatly benefited from working with industry associations in its target countries. Even though such associations usually do not provide project financing, they can help increase access to local small and medium-sized companies through a network of connections. Moreover, they can help building trustful business relationships in countries where legal investment frameworks are incomplete. Smart Hydro Power, for example, cooperated with such associations in India and Colombia to establish its sales networks.

Similar support was obtained from the Alliance for Rural Electrification (ARE), a global industry association that supports businesses involved in renewable off-grid energy production in rural areas of developing and emerging countries. ARE facilitates targeted networking and information exchange, e.g. by organizing regular networking events and sharing up-to-date information on relevant technologies and projects through their website, newsletter and weekly alert (for members). Moreover, it supports its members in accessing early financing and developing sustainable business models; and it functions as an intermediary for channelling funding from international donor financial institutions and development programs (<https://ruralelec.org>).

Additional support that would facilitate investments

Mr. Kolmsee suggests the following measures to increase investment volumes for the cleantech sector:

- Support for selecting appropriate investors other than VC funds: In the case of Smart Hydro Power, venture capital has proven to be not the best choice for developing innovative hardware for target markets outside of Europe. Services for matching clean energy start-ups with corporate investors and strategic partners need to be strengthened in comparison to matchmaking with VC funds.
- Demystifying corporate investments into start-ups: Both start-ups and corporate investors often lack understanding of the other side's key motivations and functioning. As a consequence, certain preconceptions seem to exist on both sides. For instance, a common belief is that start-ups fear of being "swallowed" by large companies. Corporations, on the other hand, might be inclined not to take young companies seriously and can be deterred by their focus on flat hierarchies and "cool"⁶⁷ products. This obstacle needs to be overcome by increasing objective and technology-centered communication between the two parties. This could be supported through the organization of round tables.

⁶⁷ This wording was used not only by Mr. Kolmsee but also by other CEOs of start-ups interviewed for the case studies. However, it was not confirmed by corporate investors whether their understanding of start-ups goes into a similar direction.

Conclusions

Smart Hydro Power was able to attract funding from two venture capital funds (HTGF, eCapital) at an early stage. Yet, Mr. Kolmsee notes that its VC investors (due to the nature of their business) are not very actively engaged in finding the right business partners for their portfolio enterprises. Therefore, it seems that the early focus on venture capital was not the most effective funding strategy for Smart Hydro Power with its difficult target markets. Matchmaking events did not lead to success, possibly because the investors present at such events are not particularly interested in hardware development for developing country markets.

Cooperation with industry associations and business angels from (or active in) the target countries, in turn, was very helpful for finding sales partners and customers and proving demand for the company's technology. Additional support might have come from corporate investors. Yet, it is necessary to "demystify" corporate investments into start-ups and to overcome preconceptions on both sides. Support for establishing such strategic partnerships, particularly with partners in the target markets, would be highly beneficial for companies like Smart Hydro Power.

Sources

Smart Hydro Power: <http://www.smart-hydro.de/>

Ecosummit (14.05.2012): Smart Hydro Power raises €2.7 Million Series A from eCapital
<http://ecosummit.net/articles/smart-hydro-power-raises-series-a-from-ecapital>

eCapital (09.05.2012): Cleantech Fonds by eCapital invests in Smart Hydro Power GmbH
<http://ecapital.de/en/nc/news/ecapital-news/news/detail/News/cleantech-fonds-by-ecapital-invests-in-smart-hydro-power-gmbh/>

5. European Investment Advisory Hub

Introduction to the European Investment Advisory Hub

European Investment Advisory Hub

Europe's gateway to investment support

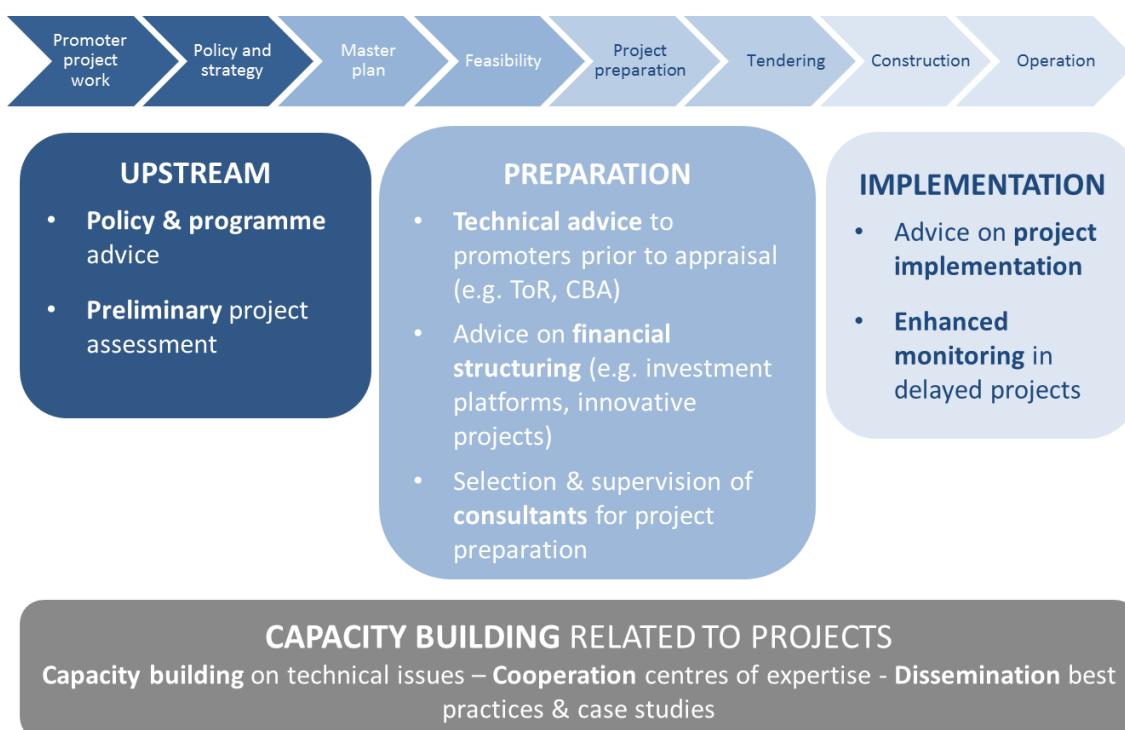
The European Investment Advisory Hub (EIAH) is a partnership between the European Investment Bank (EIB) and the European Commission. It acts as a single point of entry to a comprehensive offering of advisory and technical assistance and provides targeted support for the identification, preparation and development of investment projects across the EU and across all phases of the project cycle (figure 1). In addition, EIAH serves as an indicator for unmet advisory service needs, as it routinely assesses the profile of requests for advisory support.

The EIAH is one of the components of the **Investment Plan for Europe**, besides the European Fund for Strategic Investments (EFSI) and the EU Investment Project Portal (EIPP), a platform for project promoters and investors looking to obtain funding or invest in innovative technologies.

Services provided by the EIAH

The EIAH provides access to wide ranging support for projects and investments engaging with clients at all phases of the project cycle, from very upstream project identification, through to planning and preparation to implementation (figure 1). Service requests which the EIAH itself cannot answer are forwarded to relevant advisory services or financial programmes at the European or national level.

Figure 1: EIAH in the project cycle (Source: EIB 2017)



The EIAH's target groups and sectors

The EIAH receives requests from a large variety of entities, including public authorities (Member State or regional level), public and private companies and individual project promoters.

The projects may request technical or financial advisory support for investments in sectors that contribute to the public good such as energy, transport, digital economy, circular economy, water and waste management, urban and regional development. Innovation is a cross-cutting ‘sector’ that can apply across a number of traditional public investment sectors, notably energy and transport, as well as being a relevant sector in its own right. Often projects that have an innovation focus are seeking financial advisory services to enhance their access to finance rather than technical assistance when they approach EIAH for assistance.

In order to receive financial advisory support through EIAH, it is recommended that the implementation of the project or business proposal leads to the fulfilment of EU priorities. In addition to meeting certain threshold levels of investment needs (see Annex I), the project or proposal should be mature with a relatively strong balance sheet, indications of commercial interest or investor interest if the capital markets of the relevant Member State are sufficiently mature.

Technical and financial assistance for public and private entities

The EIAH screens and replies to all incoming requests for support whether they come from its website or through referrals from EIB colleagues or other expert sources such as the Commission.

Services for public entities: In particular for public entities, EIAH is able to offer a wide range of technical assistance⁶⁸ as well as financial advisory in areas such as project finance or accessing financing supported by the EFSI guarantee or other EU financial instruments. Technical and financial advisory support can be provided through the EIB’s technical and financial experts or through engaging external consultants⁶⁹. EIAH’s advisory services are free of charge for public entities.

Services for private entities: Private project promoters will receive an initial assessment of their advisory needs without incurring costs. Subsequently, depending upon the results of the assessment they may be

- introduced to the EIB’s lending operations (if eligible);
- introduced or forwarded to services better able to address their needs (e.g. other advisory programmes under the management of EIB, notably Innovation Finance (InnovFin) Advisory, depending upon the nature of the request - see Annex I for information on available programmes and their eligibility criteria);

While the Hub’s advisory services are free to the public sector, services provided to the private sector beneficiaries should be on a cost recovery basis. Small and medium-sized enterprises (SMEs) should not pay more than one third of the cost of the advisory services provided to them. EIAH will apply this pricing policy taking into account the principles of efficient use of public funds, transparency, proportionality and equal treatment.

⁶⁸ Technical assistance includes support for the classic project preparation studies such as cost-benefit analysis, demand studies, feasibility studies, and environmental assessments including climate adaptation strategies.

⁶⁹ If the latter choice is deemed the best option, then EIB experts support the client in establishing appropriate Terms of Reference and monitoring the quality of the results. The client will enter into an Advisory Services Agreement with EIAH which specifies the advisory services and deliverables as well as the timeline for completion.

Assessing and addressing additional advisory needs

EIAH identifies advisory and capacity building needs as well as horizontal matters (e.g. institutional frameworks, methodologies, good practice guides) which are not covered or insufficiently covered by existing programmes. It initiates refinement of existing service offers and creation of new ones if demand justifies it.

In 2016, EIAH commissioned a study to assess the existing situation with respect to investment-related project advisory activities and to identify key technical and functional capacity gaps in advisory support throughout the EU. The advisory needs of public and private entities in EU Member States were assessed by PwC with a view to prioritising needs for advisory services in the EU and thus support the development of EIAH's strategy for improving access to advisory services (PwC 2016). The study identifies seven categories⁷⁰ of services which could support project promoters across Europe. Financial matchmaking, i.e. support for identifying suitable funding sources and investors, is not explicitly listed as a service for which demand exists. Yet, the study suggests that market asymmetries in supply-demand for advisory services caused problems including with respect to access to services and availability of services which both involve matchmaking activities. According to the authors, "the fundamental problem is [...] an asymmetry between needs and supply that either prevents the need from being expressed as a demand, adds a cost or time premium, or results in poor quality of services". It is concluded that the EIAH could potentially play an important role in addressing this asymmetry by identifying unmet needs and matching requesters with available service agencies or tools.

Challenges for investment advisory

Identification of advisory needs

One of the major challenges for EIAH's work is to find out what kind of technical or financial advisory services project promoters really need and, then, to consider whether the EIAH can provide the advisory service directly or if not, to appropriately signpost the project promoter to other advisory resources whether at EU, national or local level.

Awareness of local advisory services

A challenge for identifying the right national and local promotional institutions for individual projects is being aware of the available advisory services at national and local level, as these are specific to each country and evolving over time. At EU level, EIAH often refers to the services provided by the Enterprise Europe Network supported by DG GROW and EASME and at Member State level, it relies on expertise of the National Promotional Banks and Institutions whenever possible.

Critical thresholds for EIB advisory activities

Projects eligible for the advisory services listed in Annex I generally have to have a project volume of at least EUR 15 million. For smaller projects, EIAH advisory services will be limited to light advisory for private sector promoters in particular to assist them in identifying their advisory requirements to advance the preparation of their projects or enhance access to finance as well as to orient them to more appropriate advisory services.

It should be noted that EIAH advisors are EIB staff with expertise in EU priority sectors and EU investment objectives, such as innovative energy technologies, as befits the EU public development bank. For financing of small projects, intermediated products are available through partner financial institutions in the Member States. The European Investment Fund, part of the EIB Group, works closely with such financial institutions to

⁷⁰ Project identification, project preparation, financial structuring, project delivery, procurement & state aid, capacity building, communication

create financial products for the SME sector. Some products are EU financial instruments that are supported with EU budget resources such as the H2020 programme (the InnovFin products).

Maturity of the project proposal

Another key issue for appropriately advising project promoters is the maturity of project proposals received by EIAH. In order to provide advisory services to enable projects to have a reasonable chance of reaching financial close within a two-year period, projects need to show sufficient maturity so that the focus can be on financial advisory leading to access to finance such as fine-tuning a business plan. Often projects need a combination of technical and financial advisory, in which case the technical advisory may be prioritised in order to stabilise a business plan or identify more precise investment costs.

Success factors and opportunities for investment advisory

Tapping into the network of national and regional partner institutions

The EIAH is building a cooperation platform with national promotional banks and institutions as well as local Managing Authorities. On the one hand, local partner institutions function as local points of entry to the EIAH for potential clients and stakeholders. On the other hand, they can be local agents for the delivery of advisory services on behalf of the EIAH in areas where they have expertise. This way, project promoters have access to EIAH resources through entities situated in their proximity and speaking the same language.

This network is still developing both in terms of members and the depth of service provision at local level. It is not a one-size-fits-all proposition and each Member State has a different set of circumstances that EIAH is engaged in supporting as indicated in bilateral discussions with the relevant public institutions and authorities. In this regard, recent initiatives include a series of roadshows with tailored capacity building themes, an open call for expressions of interest in local delivery of advisory services, as well as a renewed website to be unveiled before year end 2017.

Constant development of signposting system

EIAH is constantly refining its signposting system to re-direct requests that it cannot directly address. Often these requests are from SMEs seeking EU financial support (notably EFSI) for the investment or business case. In this respect, the signposting can become very detailed in identifying specific financial intermediaries in a given Member State and/or EU grant programmes that could be relevant.

In addition, EIAH is expanding its signposting to include such tools as Euroequity, a platform developed through a partnership between several national promotional banks and institutions to assist SMEs in sourcing equity finance on a pan-European basis.

The stage of the project when the request is made determines whether the signposting includes also advisory support (e.g. through the Enterprise Europe Network) in addition to the signposting to financial support.

Added Value of EIAH

Regardless of whether EIAH is ultimately able to offer advisory services directly, each request receives serious attention to identifying its project advisory needs and assisting the project promoter to advance the preparation of the project or develop a business plan. In many cases, EIAH acts as an internal champion for a project proposal, introducing it to relevant areas of the EIB (both lending and technical experts) to find the right package of advisory services to accelerate project preparation and enhance access to finance, notably access to EU financial support such as through EFSI, or InnovFin products such as the First of a Kind EDP.

Conclusions

Often projects that have an innovation focus are seeking access to finance rather than technical assistance when they approach EIAH for assistance. Nevertheless, the blockages to access to finance are often technical in nature and therefore even the light advisory service can be invaluable in pinpointing the particular technical issues that need to be addressed in order to improve the project's opportunities to access finance, especially EU financial support. In the event that a project proposal cannot be served by EU level advisory services, for example due to size or maturity considerations, such requests are usually signposted to regional, national or local entities.

Most important success factors for EIAH to deliver high-quality services is clearly understanding the support requirements of each requester and establishing and refining relevant advisory support packages to be delivered either through EIAH resources or through its cooperation network. The EIAH is well connected to advisory and financial programmes at the EU-level and within Member States. Nevertheless, EIAH has commissioned a needs assessment for the SME sector that will further define the role EIAH can play to improve the coordination, visibility, consistency and capacity of advisory services available to this sector which makes a significant contribution to the development of innovative energy technologies. The results of this study will be available in early 2018.

Sources

A major share of the information presented in this case study was obtained through a telephone with experts from the EIAH, InnovFin Advisory Services and the Projects Directorate (May 2017).

Additional online sources include:

European Investment Advisory Hub; <http://www.eib.org/eiah/index.htm>

EU and EIB (2015): Framework Partnership Agreement on the European Investment Advisory Hub
http://www.eib.org/attachments/strategies/framework_partnership_agreement_on_the_european_investment_advisory_hub.pdf

PwC (2016): European Investment Bank Market gap analysis for advisory services under the European Investment Advisory Hub (EIAH) - Synopsis.

http://www.eib.org/eiah/attachments/Market_gap_analysis_for_the_advisory_services_under_the_European_Investment_Advisory_Hub_EIAH.pdf

EIB InnovFin - EU Finance for innovators: <http://www.eib.org/products/blending/innovfin/>

EIB InnovFin Advisory: <http://www.eib.org/products/advising/innovfin-advisory/index.htm>

EIF financial intermediaries: http://www.eif.org/what_we_do/where/index.htm

European Investment Project Portal: <https://ec.europa.eu/eipp/desktop/en/index.html>

Enterprise Europe Network: <http://een.ec.europa.eu/>

EuroQuity: <https://www.euroquity.com> <http://www.accesstofinance.eu>

Invest Europe: <http://www.investeurope.eu/>

Network for eco-innovation investment: <http://www.inneon.eu/>

EIB (2015): EIB Advisory Services - Helping to Deliver Infrastructure Projects. Presentation by Alan Lynch.

<http://boostinginvestmentstransport.eu/presentations/Session%203/A%20Lynch.pdf>

Annex: Financial and technical advisory programmes in the EU

All of the programmes listed here can work under the mandate of the EIAH but also independently from it.

Thematic field	Available programmes	Eligibility criteria
Support for projects & investments Advisory and technical support in identification, prioritisation, preparation, structuring and implementation of investment projects	<p>ELENA (European Local ENergy Assistance): ELENA advisory programme is intended for the energy efficiency and renewable energy projects that go on seeking investment from <u>private banks or EIB</u>, and are promoted by public or private entities</p> <p>JASPERS (Joint Assistance to Support Projects in European Regions): JASPERS helps EU Member States develop and secure financing for projects to be co-financed by <u>EU structural funds</u></p> <p>EPEC (European PPP Expertise Centre): The EPEC aims to improve the public sector's ability to deliver high-quality Public Private Partnerships (PPPs) by providing network activities, policy advice and upstream project development support</p> <p>Other implementation support programmes</p>	<p>Projects > EUR 30 million over a period of around 2-4 years; Smaller projects can be supported when integrated into larger investment programmes</p> <p>Large projects with total costs > EUR 50 million for environmental projects, EUR 75 million for transport or other sectors</p> <p>Addressed at the public sector members of EPEC</p>
Enhanced use of EU funds Advisory and capacity building to support implementation of ESIF instruments	<p>Fi-compass: Supports ESIF Managing Authorities and other parties by providing know-how and learning tools on financial instruments that can be used under the <u>ESIF</u> (loans, guarantees, equity, etc.)</p> <p>EIB bilateral services: tailor-made services to assist Managing Authorities/intermediate bodies to set up and implement financial instruments</p>	ESIF managing authorities, EaSI microfinance providers and other interested parties from EU Member States and regions
Improved access to finance Strengthening overall conditions for financing for public and private beneficiaries	Innovation Finance Advisory (InnovFin Advisory): Supports public and private entities in structuring their research & investment projects in order to improve their access to finance; InnovFin Advisory assesses <u>all potential financing sources</u> including, but not limited to, EIB funding	Projects > EUR 15 million investment; fit the policy objectives of Horizon 2020; Not yet mature for financing appraisal

6. ETEQ Venture

The investment community



ETEQ Venture, founded in 2014, offers services to clients from the technology innovation start-up ecosystem, including start-ups, established companies and, to some degree, investors. Its mission is matching innovators with financiers

and industrial partners in order to accelerate clean tech, med tech, fin tech and other digital and hardware high tech innovation.

ETEQ Venture was founded by Ole Jakob Thorsen (partner) and Thomas Einfeldt (partner). Together they have extensive business strategy, management and marketing & sales experience in telecom and banking industries. Two additional team members are trained in financial analysis and organizational communication.

Services for start-ups and growth companies

ETEQ Venture's most important line of business consists of services to start-ups and growth companies. It assists such companies by focusing on three main aspects: developing business strategies, finding appropriate investors and post-funding services, including search for exit options. Many of ETEQ Venture's clients are in an early stage of development and growth - in fact, quite a few clients are still in the 'pre-revenue phase.'

1) Strategy services: ETEQ Venture supports its clients in developing or refining business strategies. Focus is placed on the individual companies' needs, ranging from development and test of business models and go-to-market strategies to building of supply chains and strategic partnerships and the development of sound exit strategies.

2) Financing services: ETEQ Venture helps its clients in finding the funding they require to grow. A typical funding project is built around four steps:

- Review and amendment of the business strategy and plan: The basis of financing process consists of an assessment and, where necessary or helpful, enhancement of the client's business strategy.
- Preparation of fundraising: Before the actual fundraising campaign starts, ETEQ Venture assists in carrying out the necessary preparations, including realistic valuation of the company, assessment of its funding need, development of pitching documents and preparation of other documentation.
- Rolling out of the fundraising campaign: During the search for investors, ETEQ Venture takes care of marketing and helps with prioritization of suitable investors as well as with preparations for negotiations. ETEQ Venture is continuously developing its knowledge base on what information is necessary to "get through" to investors.
- Negotiations and closing: Lastly, ETEQ Venture helps bring the negotiations to a closing and implement the funding agreement.

ETEQ Venture's experiences with different types of investors

The company has made the experience that, in general, energy start-ups are funded by two types of capital: public “soft” money and, to a limited degree, private venture capital. ETEQ’s focus is particularly on finding venture capital investors and corporate investors. Mr. Einfeldt is of the opinion that:

- There is a general lack of investors in the energy sector, especially VC investors, mainly due to the relatively long innovation and development cycles often seen in this technology domain, which is incompatible with the structural VC setup and investment horizon.
- Corporate investors often find it easier to understand and accept the business case behind energy innovations as they have better industry insights. Therefore, corporate capital may constitute a viable alternative to venture capital. However, committing a start-up to one large corporate investor often means committing its whole future to this collaboration, effectively reducing its future strategic manoeuvrability.
- Corporate venture capital, i.e. corporate-owned venture investment funds, may – if governed by general venture capitalist principles and sufficient autonomy – represent the most attractive combination of relevant industry insights and investment horizon for start-ups within the energy space.
- Business angels usually provide too small amounts of funding, particularly for energy development projects with high funding needs. They have not been part of the investor mix for ETEQ’s start-ups, except for very early seed funding rounds.
- Family offices are a motley assortment of investors, ranging from broad to very narrow technology focus and from large to small investment commitments. Within ETEQ Venture’s investor network, only a few family offices are prepared to take on investment projects with the investment horizon necessary to accommodate many energy projects.
- Pension funds would be ideal investors – because they could provide the long-term funding that energy technology development requires – but are too risk averse to finance individual innovations directly. And even though they do commit capital as partners in venture funds, these funds usually operate with much shorter investment horizons than the pension funds themselves.

3) Post-funding services: After the financing transaction is completed, ETEQ Venture provides services to companies focusing on their strategy, regularly re-evaluating the company’s rationale against market dynamics, maintaining current and potential investor relations, planning for the exit, etc.

About 20% of ETEQ Venture’s clients come from the energy sector. Examples include:

- **Stirling DK** provided small biomass fueled Combined Heat and Power systems. ETEQ assisted the company with its preparations for two funding rounds and an exit attempt.
- **Applied Biomimetic**, then **AquaZ**, develops energy-efficient membranes for desalination and other applications. ETEQ Venture assisted the company with its preparations for two funding rounds and a strategic pivot.
- **LED iBond** manufactures ultra-thin, ultra-efficient and ultra-flexible LED lighting fixtures. ETEQ Venture assisted the company with raising its A-round.
- **At the time of writing**, ETEQ Venture is working with two start-ups within the energy universe, specialized in energy storage and energy-efficient power operating systems, respectively.

Services for industry and investors

ETEQ Venture also offers **matchmaking services** for industrial partners, i.e. acting as intermediary between the innovators and industry companies. With exclusive focus on collaborative innovation projects between Nordic cleantech innovators and large corporates, ETEQ Venture co-founded this service, the Nordic Cleantech Innovation Link, with Swedish and Norwegian partners in 2014. In addition to identifying and promoting collaborative innovation projects, the Nordic Cleantech Innovation Link arranged regular company visits, workshops and other networking activities such as the annually recurring Nordic Innovation Day with the intent of bringing together innovative SMEs and industry players. Though successful, the Nordic Cleantech Innovation Link initiative was discontinued in late 2016. However, ETEQ Venture has established a new matchmaking service, Innosix, with a European scope for wide range of technology domains, see below.

Moreover, ETEQ Ventures offers **investment services** for business angels and venture investors, including strategic and risk/return assessments and evaluation of a start-up's business model (strategy, business plans, long and short-term objectives, SWOT), financial and funding aspects (ROI and valuation, funding needs, incentives, exit routes), market potential and go-to-market plans. It also assists with preparation and supervision of the necessary due diligence.

Challenges for financial match-making

Lack of mutual understanding

Many investors have no granular knowledge of the clean technology sector, thus making it hard for them to understand specific challenges and take on the risks with which (energy) innovation development comes. Some investors hire sector experts - but this is by far not the case for all investment companies. At the same time, start-ups often do not understand what information, impressions or other input investors require in order to be able to make an investment decision. Particularly engineers and technology experts seem to struggle with investor relations as they are too focused on technical details.

Selecting ideal partners from a large pool of options

The problem for investors is not to find investment opportunities but to filter down the opportunities to the ones with real potential and appropriate time-to-market. Similar challenges arise for start-ups - moving from a long list of investors to a short list is very time consuming and requires in-depth knowledge of and contacts to the investors in question.

Complexity of available public funding schemes

According to Mr. Einfeldt, available EU support schemes are designed very well but suffer from complex application and selection processes, making it challenging for interested innovators to choose the right programme and to develop successful applications, particularly for applicants with no prior experience with the specific programme.

Success factors and opportunities for financial matchmaking

Large network of potential investors

ETEQ has a network of several hundred investors across Scandinavia and, to some extent, Europe. The network was built mainly based on the industry contacts of the company's two founders. It is being expanded constantly, e.g. through online search, participation in networking events and by forwarding information through the existing investor network. According to Mr. Einfeldt, identifying investors is not complicated as they "want to be found" but takes time and personal dedication.

New matchmaking service with in-depth technical descriptions

ETEQ Ventures has developed a new service - Innosix - which will be launched online in 2017. Innosix is a database of clean tech and other technology companies covering all of Europe. The database entails very detailed information (provided by the start-ups themselves) on the technology innovations. This feature allows interested investors and industry partners to conduct focused search queries in order to identify companies that exactly match their requirements. While there are many start-ups databases, none feature such a detailed search function and are thus not as helpful for investors in search of investment opportunities. The search function works with tags, a methodology which ETEQ has been applying consistently and over time and which has worked very effectively. Through regular assessment of new tags and queries, ETEQ Venture gets good insights into which tags are trending, thus allowing it to trace and communicate technology trends. The company intends to display such information on its website in order to attract additional (financial) partners for its start-up clients. ETEQ Venture is currently building up the database with external support but hopes that in a few years artificial intelligence will be available to screen and contact relevant start-ups. The company intends to further develop the database so that it covers a broad range of countries and technology sectors.

Independent work without restrictive ties to specific investors or companies

Another success factor identified by ETEQ Venture is its independence of specific investors, companies or technology sectors. This feature is beneficial for the small company because it allows it to team up with the best and most relevant partners and freelance resources in each of its projects. Given that the company does not have any specific technology focus, it flexibly collaborates with experts and specialists whenever required, whether it is about strategy development, financing or cleantech business development. This probably gives the company more flexibility compared to other service providers which only have in-house capacities.

Additional suggestions / needs for increasing success

Mr. Einfeldt proposes that the EU should put greater effort into explaining, marketing and - if possible - simplifying the application processes of its schemes for innovation, SMEs, etc. Specifically, he proposes "micro grants" for applicants to be used for programme selection and application development.

Conclusions

ETEQ Venture uses its large network to link start-ups, industry partners and investors. While building a large network takes time and personal dedication, finding exactly the right partners for its clients is considerably more complex. Against this background, the company has been working on a database with tags to describe

innovative technologies in minute detail so that interested financiers and energy companies can identify exactly what they are searching for. The company hopes that this service will speed up the fundraising process. Besides private capital, ETEQ Venture is convinced that public money (particularly through EU schemes) is essential and very helpful for funding energy innovations and that such schemes should be simplified in order to increase their outreach.

Sources

The majority of information was obtained through a telephone interview with Thomas Einfeldt, partner of ETEQ Venture (April 2017).

Additional online sources include:

ETEQ Venture <http://eteqventure.com>

Innosix <http://innosix.com>

7. Greencrowd



The investment community

Greencrowd is a Dutch crowdfunding platform for sustainable energy generation and supply (e.g. PV, wind, hydropower, biomass and electric transport). It was founded in 2012 and is held by the Greencrowd Foundation. Through its online platform, it supports debt- and donation-based financing for energy projects. Its mission is to increase local participation in energy projects through crowdfunding.

In April 2017, Greencrowd had 1077 registered crowdfunders, 33% of whom have invested in more than one project. The platform had 35 projects listed. Greencrowd states that it receives around five funding requests per month of which is accepts on average two. Greencrowd maintains high quality standards and wants to make sure that only such projects get listed that have a sound financial structure. While the majority of projects funded through Greencrowd are based in the Netherlands, several projects are located in other countries, such as Czech Republic, Russia and New Zealand. Funding targets range from as low as EUR 3,000 (schoolyard renovations) to 700,000 (construction of a solar park).

While Green Crowd's focus is on established renewable energy technologies, it also supports more innovative technologies (e.g. in the energy storage sector) as well as projects are still considered "uncommon" for crowdfunding (e.g. production of natural green fertilizers). Greencrowd mitigates the risks of such projects through sound financial structuring.

Greencrowd and Greencrowd Foundation do not receive any public funding or other public support.

Crowdlending services

Greencrowd operates an online platform through which it markets energy projects, attracts investors and facilitates investment. Loans through crowdlending are intended to partly finance or refinance a project. The pledged loans are only executed if the project has raised the intended amount of financing in the set timeframe. Often, there are more tranches with differing maturities and interest rates.

Greencrowd provides the following services:

Structuring and risk assessment

In order to be listed on the Greencrowd website, project owners have to present adequate securities. Greencrowd conducts analysis, risk assessment and due diligence. Based on that, projects are rated on scale from A+ to F. The thoroughness of the project and project owner verification sets Greencrowd apart from other crowdfunding platforms. The Greencrowd message is "if we cannot structure it, you cannot finance it". Another rule of thumb is that the founder of Greencrowd, Jan Willem Zwang, needs to be willing to invest in the project, otherwise it will not be listed on the platform.

Information and marketing

Greencrowd publishes information memorandums for every project containing the project analysis and risk assessment. These memorandums are available online while the project is open for funding. Greencrowd then disseminates project information through various channels, including a newsletter, Facebook, Twitter,

GoogleAd, websites of affiliated companies and magazines. It also participates in events initiated by local energy community platforms and holds presentations at various occasions, including at the municipal level.

Greencrowd places great emphasis on marketing with its previous investors as these are often willing to make further investments. As the number of Greencrowd projects grows, so does the investor base. According to Mr. Zwang, the number of investors more than doubled in the last 18 months due to the increasing number of projects promoted. These investors often first invest locally, i.e. in projects that are located in their community or region, and then expand their investment horizon as their experience grows.

Acting as lender on behalf on their crowd funders

Once the pledged amount of funds has been reached, the individual crowdfunders' contributions are accrued in the Greencrowd Foundation, which on-lends it on their behalf to the contractor who executes the project. When the contractor is paid by the project investor for fulfilling their contract obligations, part of that payment accrues back to Greencrowd Foundation and is used to redeem the crowdfunders' loans and pay interest. Greencrowd Foundation is not allowed to make profit; any remaining funds are donated to charity.

Commercial advisory services

Besides crowdfunding, Greencrowd also incorporates the Greencrowd Energy BV division which carries out commercial activities, e.g. structuring and developing renewable energy projects, and securing their financing from large high-equity investors/lenders such as banks and equity funds. Many of the projects are funded by public and religious institutions.

In addition, Greencrowd operates two funds with a volume of EUR 20 million each. These funds invest in rooftop solar projects, covering not only the construction but sometimes also development costs.

Challenges for matchmaking and crowdfunding

Finding investors and matching them with the right projects is not generally a problem that Greencrowd experiences. According to Mr. Zwang, all projects listed on the platform have so far reached their funding goals. Hence, the following discussion will go beyond matchmaking.

Inadequate projects

Mr. Zwang notes that the major problem for crowdfunding is the quality of the project proposals. Greencrowd often has to become very engaged with the project promoters before a project can be listed, telling them which permits to obtain; which financial documents to prepare; which public support schemes to apply to; etc. This process can be very time consuming.

The challenge is thus to “filter” promising projects as early as possible in order to reduce transaction costs for Greencrowd and to provide sound investment opportunities for crowdfunders. At the same time, it would be important to communicate crowdfunding requirements widely among potential promoters so that these can develop good project proposals.

Widening the investor base

Findings of the H2020 CrowdFundRES project show that “for all platforms and perhaps not surprisingly the size of their investor base and cost of acquiring new investors was the core restraint to growth” (CrowdFundRES 2016). For Greencrowd, this issue is also prevalent. As described above, their main strategy for acquiring new investors is based on matching local projects with local investors and then slowly winning these investors for

projects beyond their regional scope. This strategy, combined with other marketing mechanisms, has allowed Greencrowd to grow steadily. Yet, the number of investors is still too small to fund more large-sized projects in the range of EUR 500.000 or more.

Mr. Zwang expects that winning more investors would take a lot of time and communication but that it should be possible as investors are keen on diversifying their portfolios and on trying new investment vehicles.

Crowdfunding regulation

Proceedings of a European Policy Workshop, conducted under the CrowdFundRES project in January 2017, showed that **cross-border crowdfunding** appears to be a major obstacle for crowdfunding in general and for renewable energy project financing (CrowdFundRES 2017). This is against the background that the regulatory environment on crowdfunding is relatively fragmented, both in Europe and beyond. Yet, Greencrowd was able to overcome regulatory barriers to some countries and now supports a number of European and international projects. It is currently trying to start funding projects in Belgium where it has hired an agent to ensure compliance with Belgian regulation. However, barriers to expanding crowdfunding activities to the USA and to US-American investors are indeed a major challenge.

Another potential regulatory challenge is complying with **national regulation**. In 2012, when Greencrowd was founded, no crowdfunding regulation was in place and platforms did not have to obtain operating permits. Starting in 2014, more specific requirements for crowdfunding platforms were introduced, i.e. an “exemption” had to be granted and the financial qualification of Green Crowd’s staff was tested. In 2015/2016, new regulation came into force⁷¹. For Green Crowd, compliance with this new regulation was costly but did not prove to be a major problem. However, Mr. Zwang notes that there are several issues linked to the threshold for exemption from prospectus requirements (EUR 2.5 million):

- Crowdfunding platforms remaining below this threshold (or even surpassing - but not reporting - it) are not supervised by the Dutch financial authority. If such platforms are involved in fraud or cause/ experience other problems, a bad light is shed on other platforms, too.
- The threshold tempts many small energy projects to start their own crowdfunding campaigns without fully understanding the legal requirements and obligations. This can lead to serious legal problems for such project promoters if issues occur that negatively affect the crowdfunders.

Overall, Greencrowd’s not-for-profit character reduces the impact of regulatory challenges on the crowd funding platform. It is not required to make profits and can thus react more flexibly to changes and is less driven by cost considerations.

Success factors and opportunities for matchmaking and crowdfunding

The following success factors are of different relevance and reliability. The first factor described here, “experience of team members and network partners in relevant industries” is only indirectly relevant for matchmaking. It allows Greencrowd to develop sound projects which, in turn, establishes trust among Greencrowd’s investors and possibly incentivizes them and others to become regular crowdfunders. The other

⁷¹ The new crowdfunding regulation, which is in addition to regular financial regulation in the Netherlands, requires equity- and loan-based crowdfunding platforms exceeding a total investment volume of EUR 2.5 million to obtain a license from the Dutch Authority for the Financial Markets (AFM) and comply with prospectus requirements; conduct an individual assessment with each retail investor in order to determine whether the investment is sound for this particular retail investor (i.e. not exceeding 10% of his/her freely available financial assets); inform investors on the project risk and provide for easy cancellation opportunities; report to AFM on a semi-annual basis; etc.

factors are also focused on creating transparency and developing attractive offers in order to attract investors, rather than on the process of identifying investors and making matches with projects.

Experience of team members and network partners in relevant industries

As described above, selecting the right projects and bringing them to a point where they can be funded is an important challenge for Greencrowd. Against this background, Mr. Zwang notes that team composition is a very important factor that can determine the success (or failure) of crowdfunding platforms. Greencrowd's team members have previously worked in the energy sector and/or the financial industry.

Technical expertise: Greencrowd team members have long-standing experience in advising project promoters on the development, construction, financing and operation of renewable energy projects. As a result, they have firsthand experience of the risks in various phases of renewable energy projects until the moment they are actually in operation. While focus is on established renewable energy technologies, Greencrowd staff have also been willing and able to gather expert knowledge on energy innovations and less established renewable energy technologies or processes, e.g. for green fertilizer production. In addition to its in-house expertise, Greencrowd has built a large network of experts in the energy market.

Financial expertise: Greencrowd has similar eligibility criteria as banks but is more willing to engage with project promoters in order to determine the best financial structure. Greencrowd also benefits from very good communication with the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland, RVO) and with financial players, such as tax authorities, banks and funds.

Marketing through public initiatives

Greencrowd has an initiative called Onze Club Kracht (Our Club Force) which it conducts together with Rabobank, Triodos Bank, Less Energy and Vitesse. The aim of this initiative is to support sports clubs in moving towards greater energy efficiency and use of renewable energy by helping them apply for the Dutch public support program and by organizing the crowdfunding or crowdlending process. This initiative probably increases the visibility of Greencrowd among potential investors, e.g. sport club members.

Special offers for investors

Greencrowd, in agreement with the project promoters, can offer special conditions (e.g. higher interest rates) to the crowdfunders. Such conditions are linked to the fulfillment of certain criteria on the side of the investor (e.g. investment exceeding amount x) or project promoter (e.g. amount of energy generated through the newly installed equipment). In case of a green fertilizer project, for example, crowdfunders which contribute more than € 25,000 receive an additional interest rate of 0.5%.

Transparent risk communication

Greencrowd openly communicates the risk ratings of its projects on the website. This approach seems to allow for greater transparency than is provided by other crowdfunding platforms. Yet, it is uncertain whether this factor positively influences investment decisions.

Additional suggestions / needs for increasing success

Mr. Zwang suggests the following measures to increase investment volumes for the clean energy sector:

- Support for taking on more risk: In the Netherlands, public guarantees are available for bank lending but not for crowdfunding. Such guarantees would help expand the range of projects that can be funded

through crowdfunding. However, it needs to be made sure that crowdfunding platforms maintain high risk management standards.

- Increasing trust through supervision: The Dutch financial authorities need to start supervising platforms that exceed the determined threshold in order to ensure compliance with existing regulations, especially related to investor protection.

Conclusions

Greencrowd supports a small number of energy projects that feature more innovative technologies than other projects. While these undertakings might require more in-depth familiarization with the technologies and their specific funding requirements, Greencrowd has not made the experience that such projects are more difficult to match with investors. Clear expertise in the energy and financial sectors, general trustworthiness and (at least initially) some linkages between the investors and projects (e.g. through geographical proximity) are the most important factors that determine whether previous investors become regular crowdfunders and whether new investors can be won. Yet, it also has to be mentioned that Greencrowd is a not-for-profit crowdfunding platform and that its experiences might differ from those of commercially oriented platforms.

Sources

The majority of information was obtained through a telephone interview with the Greencrowd founder, Mr. Jan Willem Zwang (April 2017).

Additional online sources include:

Dutch Group (2014): Dutch Impact Investors: Overview of Impact Investors and Platforms in The Netherlands
http://www.businessangelseurope.com/Knowledge%20Centre/Research%20%20Data/Dutch%20Impact%20Investors_20140625.pdf

Greencrowd website, <https://greencrowd.nl/>

Green Crowd: Zonnepanelen op De Lommerd
<https://greencrowd.nl/project/zonnepanelen-op-de-lommerd>

Greencrowd (2013): Informatiememorandum project “Zonnepanelen gemeentelijke gebouwen Leeuwarden”,
https://greencrowd.nl/uploads/project/IM_Leeuwarden_publieke_gebouwen_V2.pdf

Greencrowd (2016): Projectbeschrijving van de financiering van de ombouw van EVnet laadpalen door Chargepoint Europe, https://greencrowd.nl/uploads/project/Projectbeschrijving_Chargepoint_Europe.pdf

Greencrowd (2016): Projectbeschrijving van de investering in zonnepanelen op het dak van het gemeentekantoor in Zaltbommel,
https://greencrowd.nl/uploads/project/Projectbeschrijving_zonnepanelen_Zaltbommel.pdf

Greencrowd (2016): Projectbeschrijving van de investering in de ontwikkeling van 200 MW wind in Moermansk,
https://greencrowd.nl/uploads/files/IM_Windlife_update.pdf

CrowdFundRES (2015): Review of Crowdfunding Regulation & Market Developments: “Unleashing the potential of Crowdfunding for Financing Renewable Energy Projects”
http://www.crowdfundres.eu/wp-content/uploads/2016/05/CrowdFundRES_D3.1_Regulatory_analysis.pdf

CrowdFundRES (2016): Report on the practical experience of RES project financing using crowdfunding
http://www.crowdfundres.eu/wp-content/uploads/2016/09/CrowdFundRES_Case_Studies.pdf

CrowdFundRES (2017): European Policy Workshop: Proceedings of the European Policy Workshop
<http://www.crowdfundres.eu/wp-content/uploads/2017/04/D4.3.-Proceedings-EU-Policy-Workshop.pdf>

8. InnoEnergy

The investment community



InnoEnergy is a “Knowledge Innovation Community” that consists of a Europe-wide network of InnoEnergy centres and partners. It was established in 2010 and has its headquarters in Eindhoven, Netherlands. InnoEnergy is part of the larger European Institute of Innovation and

Technology (EIT) community, together with EIT Climate, EIT Digital and other communities.

Mission and activities: InnoEnergy’s mission is *“to build a sustainable long-lasting operational framework amongst the three actors of the knowledge triangle in the energy sector: industry, research and higher education, and ensure that this integration of the three is more efficient [...]”* (InnoEnergy Website).

InnoEnergy’s services and programmes are built on three pillars:

It offers business creation services for energy-related start-ups and entrepreneurs	It promotes and funds energy innovation projects for the development of new products/services	It offers education opportunities ⁷² for entrepreneurs and students (e.g. Masters and PhD programs; webinars; etc.)
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Technologies: InnoEnergy’s technological focus ranges from energy storage, energy efficiency, renewable energies and energy from chemical fuels to smart and efficient buildings and cities, smart electric grids, nuclear instrumentation and clean coal and gas technologies.

Project offices: InnoEnergy is physically present in 8 EU countries with offices and has partners in 17 countries as well as in Israel. The regional offices are local representations to implement a European offer.

Sources of funding: InnoEnergy is funded to a major extent by the EU via the EIT. However, it also has 26 shareholders, including universities and academic institutions (TU Eindhoven, UPC), research centres (Catalonia Institute of Energy Research, TNO, Karlsruhe Institute of Technology), utilities and ESCOs (EDF), a petroleum multinational (Total) and industrial and technology multinationals (ABB), who contribute funding. These shareholders originate from the consortium who won the tender for implementing InnoEnergy. The shareholder structure has evolved since then, with shareholders selling their share and new shareholders entering.

InnoEnergy’s revenue streams for financial sustainability also include kick-backs from co-investments in the development of new products/services as well as the support services provided to entrepreneurs and start-ups. The kick-back can take different forms like equity or revenue sharing. In its education business line, InnoEnergy has recently moved away from offering subsidized master programmes to a value-pricing model.

All profits made through InnoEnergy have to be re-invested; no dividends are paid out to shareholders.

InnoEnergy Networks

⁷² InnoEnergy’s educational programmes will not be discussed here as they are not directly relevant for innovation finance.

Partner organisations: The InnoEnergy network includes its 26 shareholders, as well as more than 250 associate and project partners from across the energy value chain, including research institutes, academic institutions, accelerators, tech and engineering SMEs, industrial corporations, and utilities. The majority of these partners are involved with InnoEnergy through specific projects. In the context of the Highway™, (the accelerator program for early stage ventures), they provide technology and market-related expertise, help test the technologies under development and are often among the first to adopt the innovative solutions that the InnoEnergy start-ups launch on the market.

Venture Capital Community: InnoEnergy has built a community of twelve large European Cleantech funds which together manage over EUR 2 billion in equity. The venture capital companies in this community have privileged access to invest in the start-ups promoted by InnoEnergy. Even if investment is not an option, they provide regular feedback on the supported start-ups and participate in industry events, such as the Business Booster, where they network with high growth ventures. The members of InnoEnergy's VC community were selected based on assets under management (with the intent to attract the major European investors), their focus on sustainable energy (either exclusive or at least with major teams dedicated to this field), a good track record and a reputation as opinion-setters, and adequate geographic diversification (to be able to cover the necessary geographic scope). Each VC has different, specific focuses and requirements and chooses which start-ups to fund selectively. Although some of the members of the VC Community only invest in later-stage start-ups (their main objective for participation in the community is to qualify their pipeline for later stage investments), three major investments into InnoEnergy start-ups have been achieved so far.

InnoEnergy also has access to local business angel networks and family offices. It has recently reached an agreement with the European Business Angels Network (EBAN) to promote investment of business in sustainable energy start-ups.

Services for start-ups (business creation)

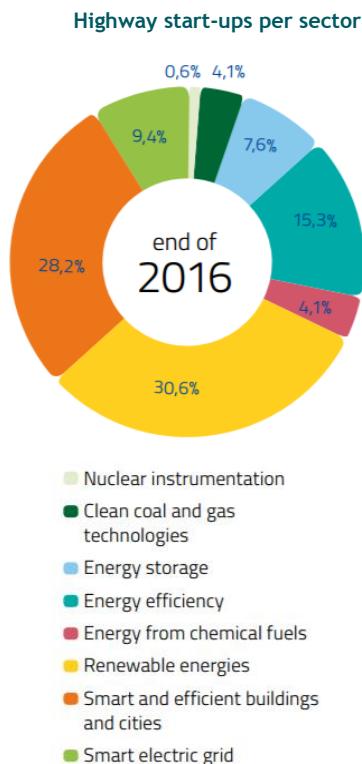
Through its Highway™ and Boostway™ programmes InnoEnergy helps entrepreneurs, start-ups and small companies in transforming their products and services into successful business models.

1) InnoEnergy Highway™

InnoEnergy Highway® is a one-stop shop for transforming a business idea into a successful company. Its unique value proposition is based in four pillars:

- **European coverage:** providing access to InnoEnergy's Europe-wide network of industry partners, universities and research centres
- **Specialization in sustainable energy:** allows offering energy-related technology due diligence, labs, proof of concept (POC), prototypes and technical expertise.
- **A commitment to finding first customer:** InnoEnergy is actively involved with the entrepreneur in finding a launching customer.
- **An integral approach:** InnoEnergy Highway® supports ventures with an integral approach covering four dimensions that are vital to a successful business.

The four dimensions of the InnoEnergy Highway® integral approach are as follows:



Technology: InnoEnergy performs the due diligence on the technology, and assesses its innovativeness and economy viability. It helps with protection of intellectual rights, product or service development plans, provides access to partner's labs and testing facilities, support in technology enhancement/development, piloting and industrialisation, etc.

Market: Market and competitors are assessed, gaps and business opportunities are analysed and a business case is developed. Great emphasis is placed on customer development and commercialisation, specifically on finding the first customer.

Team: The necessary skills are identified and brought on the team, e.g. through training and team completion.

Finance: The services provided through the Highway® programme usually translate into InnoEnergy acquiring an equity stake of approx. 10% (or else InnoEnergy has at least a term sheet that provides for the acquisition of equity). Moreover, it facilitates access to money and investor networks (*see box for more information on financial matchmaking services*).

In each of those areas, expertise from the partner network is critical to providing start-ups with tailored services.

In order to be eligible for the InnoEnergy Highway™ the start-ups must exhibit the ability to introduce their product to the market in 2,5 years and to contribute to the strategic objectives of InnoEnergy - decreasing costs of energy and greenhouse gas emissions and increasing security and operability of the energy system.

So far, 172 ventures have been served by the InnoEnergy Highway™. Out of those, 95 start-ups resulted, meaning the ventures have signed a contract with a first customer or attracted external investment above EUR 500,000. The InnoEnergy Highway™ start-ups have so far raised EUR 55 million in external investment, with another EUR 20 million in the pipeline.

Financial matchmaking services

InnoEnergy supports start-ups in accessing external sources of funding. Where feasible, business models are built in such a way that financing can be generated through customers and revenue. InnoEnergy also facilitates contacts to its VC Community and to individual venture capital firms as well as to European Business Angel Networks and corporate investors. They achieve this via:

- **Matchmaking events:** One annual event, The Business Booster, brings together over 150 InnoEnergy assets with potential customers and investors. In 2016, almost 700 participants from 32 countries were present. Only InnoEnergy ventures can attend and pitch at this event, but registration is open to industrial representative and investors. Additionally, there is a speed dating event every year where selected ventures meet with the VC community members.
- **Provisioning of data on investment opportunities (for investors):** InnoEnergy maintains a portfolio with key data on start-ups and their technologies. The portfolio is available only to the VC Community members who then select the start-ups for more detailed assessment. Additionally, selected InnoEnergy assets are presented to the VC community on a quarterly basis. For innovators, in turn, there exists no portfolio of investors to browse through.
- **Direct invitation of investors whom InnoEnergy knows through its network**

- **Word of mouth**, e.g. if start-up coaches „advertize“ their start-ups to investors

InnoEnergy also helps start-ups apply to navigate through and apply to public support schemes at EU level, e.g. EIB's InnovFin Facility and the European Fund for Strategic Investments (EFSI). InnoEnergy does not systematically facilitate access to national bank loans or crowd funding but considers expanding its scope after gathering experiences from EIB loans. InnoEnergy pays attention that public support schemes do not turn into the focus for financing (instead of sales). Moreover, it is crucial to make sure that public finance makes business sense and that the costs of the money (e.g. for meeting reporting requirements) are duly considered.

2) InnoEnergy Boostway™

Boostway™ is InnoEnergy's programme for more firmly established companies (mature start-ups and small companies) looking to consolidate and grow their business. The main support under this program is for internationalization and manufacturing scale-up. InnoEnergy's extended network provides support in finding the funding for these processes. Moreover, InnoEnergy invest money itself and is paid back through revenue sharing.

Services for innovation projects

InnoEnergy fosters innovation “from lab to launch” by linking researchers and innovators with the necessary partners and resources to develop prototypes into commercially-ready products in under five years. This approach is also meant to support Europe’s energy industry in identifying, developing and taking up innovative ideas that add value to their businesses. InnoEnergy ensures that complementary skills and resources are available to each project by publicly announcing and widely promoting the call for participation in new innovations projects through various channels; and by organizing match-making activities.

InnoEnergy funds a feasibility study, co-finances product development and facilitates financial and commercial support from outside investors. InnoEnergy is usually paid back through revenue sharing once the new product has been launched successfully, although other means of payback are also used when suited.

In order to be eligible for an innovation project, the technology under development has to be at technology readiness level 5 (laboratory testing of an integrated system) or preferably higher. Further application criteria include that the product or service should be ready for market deployment within five years, and that the launching customer has been part of a consortium of three to seven European partners from both research and industry sectors. InnoEnergy can help with matchmaking to fulfil this criterion.

Funding for innovation projects: Innovation projects are open for all kinds of companies, including multinational corporations and start-ups. Accordingly, the funding structure differs between innovation projects. Depending on the financial strength of the consortium, InnoEnergy covers 20-80% of project costs. The rest has to be secured by the partners themselves, and usually consists of a mixture of a public and private funding, incl. from companies' own means. Often, the biggest share of funding comes from the consortium itself, especially where large companies are involved or where projects have a long financial history. Medium-sized companies, in turn, often rely more on external funding sources. Following an assessment of the funding requirements and opportunities, InnoEnergy supports innovation project consortia in accessing such additional sources of funding.

InnoEnergy has so far invested EUR 157 million in 83 products and services from which 77 patents were filed, with foreseen sales of about EUR 3 billion.

Challenges for financial match-making

InnoEnergy is not able to match every start-up or innovation project with investors. Among the many success stories, there are also projects that did not make it to market deployment. One such example is EnerTwin, an innovation project aiming to deliver a micro combined heat and power unit. Due to internal (time-to-market) and external factors (regulatory changes negatively affecting its business case) it ultimately failed to find financing for upscaling.

The InnoEnergy contact persons involved in the development of this case study identify several challenges for clean energy innovations⁷³. These are not limited to the process of identifying and selecting investors (financial matchmaking or fundraising) but also relate to more general aspects such as designing good business models.

Skills and priorities of the start-up

Many start-ups fail to identify the right business model for their product, market and company. Specifically, they are not focused on finding customers and delay this aspect until the product is ready. This has resulted in products with a high degree of technological novelty, which then failed to translate into the necessary marketability. Start-ups would need to become more market-driven, reach out to potential customers, get market feedback, find customers willing to take part in piloting projects, secure letters of intent, etc.

In other occasions, start-ups fail to adequately prepare for meetings with potential investors. Since the competition is strong, this alone can result in rejection of financing for the project.

Lack of financial instruments tailored specifically to energy technology projects

VC firms and business angels are the dominant sources of funding for energy projects but are not a viable solution for all projects. Finding the right type of investor can be difficult as the available options do not clearly fit the requirements and risk profiles of energy innovation projects.

- **Institutional VC** companies and funds have generally demonstrated an aversion towards investing in early stage energy technology projects. High capital expenditures in the early development stages and long technology development periods are problematic for investors for two main reasons: the development horizon is generally longer than the VCs' investment horizon; and their investment and share in the company will likely be diluted in successive investment rounds.
- **Corporate investors** have shown to be more interested in investing in long-term hardware development. However, involvement of corporate investors usually comes at the price of their entry as a strategic partner (rather than only financial partner), with ownership often exceeding 50%.
- **Family offices** are typically looking to invest small amounts of capital across a range of projects. Such funding contributions often do not suffice for the longer development periods and piloting of technologies.
- **Bank loans** are usually out of reach for entrepreneurs and young companies due to the short life of the venture and the lack of positive financial history.
- **InnovFin Energy Demo Projects (EDP)**, an initiative of the European Commission and the European Investment Bank Group (EIB and EIF) to support the development and commercialization of first-of-a-kind energy technologies under Horizon 2020, has a minimum loan threshold of 7.5 million EUR and a minimum

⁷³ All challenges, success factors and additional suggestions described in the following chapters are individual opinions voiced by the InnoEnergy staff interviewed for this case.

total project cost of 15 million EUR. This is above typical InnoEnergy go-to-market plans of 3 to 5 million EUR. Moreover, InnovFin EDP is limited to technologies in renewables and fuel cells and hydrogen.

- **Crowdfunding** is not very relevant for most energy innovation projects as these are often too complex to attract crowdfunding investors. Nevertheless, InnoEnergy-supported start-up ecoligo recently raised EUR 107.000 through their crowdinvesting platform within a mere 6 days. This sum will finance its first solar project. Crowdfunding can also help with testing the business model.

Further issues are related to the design of instruments that are meant to incentivize such potential investors to engage with pre-commercial start-ups:

- **The InnovFin SME Guarantee Facility** provides guarantees for loans to SMEs in the range of EUR 25,000 - 7.5 million. Yet, it guarantees only 50% of the lending sum and, hence, does not provide enough incentive to make such lending attractive for banks.

Reluctance to invest in services with new revenue mechanisms

New business models are service-based, with an initial upfront investment being paid back by delivery of services over time. However, even in this set-up an initial investment in capital expenditure is required. Yet, large companies prefer to pay for services rather than buying fixed assets. Start-ups with such revenue models thus often require additional support in finding funding to cover their investment costs and early working capital requirements.

Success factors and opportunities for financial matchmaking

As with the challenges, the following success factors are not limited to the process of fundraising but also serve to reduce the inherent risks of energy technology development, thereby increasing attractiveness of energy-related projects to investors.

Business networks across Europe

InnoEnergy notes that trusted relationships with investors function as an important key factor for matching innovators with financiers. InnoEnergy creates trust by creating transparency around methods and processes, through people, and continued building of a track record with respect to success business cases. Networking events and the establishment of an investor community have proven very valuable, providing the opportunity for the innovators and investors to connect on a personal basis. Even when this does not directly lead to investments, the feedback gained from potential investors helps innovators in developing their start-ups and eventually finding investors. An office in Brussels has also proven valuable for its proximity to (public) energy investors.

Focus on commercialization

According to InnoEnergy, entrepreneurs and researchers should adopt the view that an innovation is only really innovative if it can survive in the market. As a conclusion, it makes sense to search for a “commercialisation partner” who shares the strategic interest for the commercialisation to succeed and takes the necessary risks. On InnoEnergy’s side, measures are in place to address this issue - innovation project consortia are required to have at least one pilot customer aboard, or an organization that can support market entry. In the InnoEnergy Highway® programme, focus is also placed on finding launching customers.

Reduced risk through public investment

InnoEnergy believes that its participation in projects has a positive impact on the projects' standing in the eyes of other potential investors and is seen as a risk-minimising factor. When applying for a bank loan, having a corporate shareholder like InnoEnergy is an advantage in the risk evaluation to which start-ups are subject to. Another expected indirect effect (yet to be materialized) is that obtaining an EIB loan should also have a positive impact on awarding other bank loans.

Focus on sustainable energy

InnoEnergy's expertise and networks are clearly focused on energy-related technology. Given the complexity of energy innovations, this focus allows the community to develop a detailed understanding of the technologies under consideration and to reduce technology-related risks. Both InnoEnergy and potential investors or strategic project partners are able to conduct high quality due diligence and foster expertise.

Additional suggestions / needs for increasing success

- It was suggested that InnoEnergy itself would benefit from additional funding to further upscale its services. Especially impact investors were cited as an interesting source of funding for InnoEnergy.
- The one-stop advisory facility (proposed in the Communication *Accelerating Clean Energy Innovation*⁷⁴ by the European Commission, 2016) to orient potential investors and developers among the different instruments available is a good initiative from InnoEnergy's point of view. Such a facility could serve as a means to provide information, technical assistance, guidance and even match-making to solve immediate financing needs. It could also develop a guide on which public instrument is best considering the specific project.

Impact could be further increased, in particular for start-ups and SMEs, by adding a strategic advisor role that rests upon three pillars: 1) Knowledge of the market; 2) Understanding of the companies' financial needs (which includes knowledge of the context/market and its boundary constraints, the company's business strategy, etc.); 3) Knowledge and connection to available (public) funding instruments.

Such an approach would increase the chances of market entry of start-ups. Amongst other things, it would allow the CEO/team of start-ups to focus on customers and sales instead of closing the next financing round and "killing" the business while doing so (through neglect of sales).

- Public authorities could advance the market uptake of innovative energy technologies by introducing procurement policies that are more decisively oriented towards clean technologies.
- Regarding the lack of funding in the range of EUR 3-5 million, the InnovFin range could be expanded by lowering the threshold for eligible projects
- Another opportunity would be to increase incentives for commercial banks to take on the necessary risks and offer loans in the mentioned frame, e.g. by raising the guarantees provided under the InnovFin SME Guarantee Facility to up to 100%.
- It can also help to establish a favourable tax regime for VCs if returns are re-invested into new ventures.

⁷⁴ European Commission 2016: "The European Commission is working towards at least doubling the budget of the InnovFin Energy Demonstration Projects scheme, as well as expanding its scope, using funds channelled from different sources including Horizon 2020, the European Fund for Strategic Investment and other instruments. Synergies with other instruments are being developed, aiming for a one-stop advisory facility to orient potential investors and developers among the different instruments available."

- In more general terms, market fragmentation issue and efforts should focus on harmonisation in order to offer to European organisations an easily accessible market of 500 million people.

However, any of these changes should be done with the necessary caution to prevent raising new barriers.

Conclusions

Access to finance is one of InnoEnergy's key themes. It is active in this field by 1) investing into start-ups and innovation projects and by 2) supporting the start-ups and project consortia in searching for external funding. InnoEnergy features a VC community made up of eleven large VC firms from all across Europe. The members have privileged access for investing in InnoEnergy assets and provide individual feedback on selected start-up companies. Close ties with business angel networks and family offices and regular networking events complement InnoEnergy's fundraising approach for start-ups. Where appropriate, InnoEnergy also offers support for application to relevant EU support schemes. Yet, while InnoEnergy's large networks and presence in several countries are expected to help innovators identify the right investors, support for business model development and finding first customers is believed to be even more crucial.

Sources

The majority of information was obtained through a written survey completed by InnoEnergy (March 2017) as well as through a telephone interview with Dirk Bessau, former director of the InnoEnergy office in Berlin (March 2017).

Additional online sources include:

European Commission (2016): Accelerating Clean Energy Innovation

http://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v6_0.pdf

FCA (n.d.): KIC InnoEnergy as a 'one-stop shop' - from an idea or start-up to a successful company

<http://fca.be/en/article/kic-innoenergy-one-stop-shop-idea-or-start-successful-company>

InnoEnergy (n.d.): About InnoEnergy

<http://www.innoenergy.com/about/about-innoenergy/>

InnoEnergy (2016): Engineering innovation A sustainable energy future for Europe

http://www.innoenergy.com/wp-content/uploads/2016/11/Corp_Brochure_Oct_2016.pdf

InnoEnergy (2016): InnoEnergy Highway® The European sustainable energy accelerator

http://www.innoenergy.com/wp-content/uploads/2014/04/IE_Highway_Rebranded_F2_web-1.pdf

InnoEnergy (n.d.): Product: EnerTwin

<http://www.innoenergy.com/innovationproject/our-innovation-projects/mtt-micro-chp/mtt-micro-chp/>

InnoEnergy (2017): The Business Booster; <http://tbb.innoenergy.com>

InnovFin (2016): SME Guarantee

http://www.eif.org/what_we_do/guarantees/single_eu_debt_instrument/innovfin-guarantee-facility/call/innovfin-sme-guarantee-frequently-asked-questions.pdf

Annex 2: List of interviewees

Table A2-1 provides an overview of the people who have been interviewed for this study.

Table A2-1 List of interviewees for this study

Category	Organisation	Type of organisation	Name of interviewee	Role of interviewee
Innovator	Exasun	Innovator	Michiel Mensink	CEO
Innovator	Naked Energy	Innovator	Nicholas Simmons	Director
Innovator	Ngenic	Innovator	Bjorn Berg	CEO
Innovator	Oxford PV	Innovator	David Smyth	CFO
Innovator	PENLIB	Innovator	Yannick Molmeret	Project Manager
Innovator	Resen Waves	Innovator	Per Steenstrup	CEO
Investor	Deutsche Bank	Bank	Lada Strelnikova	Investment Manager
Investor	N/A	Business angel	Andrew Morton	N/A
Investor	Abundance Investment	Equity crowdfunding	Tom Harwood	Operations Manager
Investor	Lumo	Equity crowdfunding	Alex Raguet	President
Investor	Axis Alternatives	Investor	Ulf Clerwall	Senior Manager
Investor	Demeter & Partners	Private equity fund	Stephane Villecroze	Managing Partner
Investor	Capillary Oy	Venture capital fund	Timo Vartiainen	Director
Investor	Cleantech Invest	Venture capital fund	Tarja Teppo	Partner
Investor	eCapital	Venture capital fund	Bernd Arkenau	Partner
Investor	Emerald	Venture capital fund	Gina Domanig	Managing Partner
Investor	Idinvest	Venture capital fund	Nicolas Chaudron	Partner
Investor	Yellow & Blue	Venture capital fund	Albert Fischer	Managing Director
Matching platform	Clean Energy Trust	Accelerator	Paul Seidler	Director
Matching platform	Climate-KIC	Accelerator	Malte Schneider	Director
Matching platform	Climate Bonds Initiative	Intern. organisation	Diletta Giuliani	Policy Analyst
Matching platform	CDP	Matching platform	Conor Riffle	Director
Matching platform	Cleantech Group	Matching platform	Stephen Marcus	Director
Other	CPIA	Consultancy	Anna Lehmann	Managing Director
Other	Wellershoff & Partners	Consultancy	Cyril Demaria	Head Private Markets
Other	Eversheds	Law firm	Charles Reynard	Partner
Other	Eurocrowd	Network	Oliver Gajda	Executive Director
Other	Securechain	Research project	Frederic Horta	Unknown

Trinomics B.V.
Westersingel 32A
3014 GS Rotterdam
the Netherlands

T +31 (0) 10 3414 592
www.trinomics.eu

KvK n°: 56028016
VAT n°: NL8519.48.662.B01

