MASTER

Accelerating the energy transition through intermediary management of high-growth energy firms

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Accelerating the energy transition through intermediary management of high-growth energy firms

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Appendix Report

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1ML05 – Literature review

Accelerating the energy transition through intermediary management of high-growth energy firms

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Eindhoven, 21-04-2018
Abstract

This systematic literature review is conducted prior to the master thesis project aiming to improve the understanding of intermediaries in the Dutch renewable energy market organized to stimulate high-growth firms. The literature review delivers an overview of the scientific enhancements regarding three fundamental concepts central to this research: *energy transition, high-growth firms and intermediaries*. Chapter 1 gives an introduction of these research themes is given followed by a problem statement. Chapter 2 describes the methodology of this systematic review which is based on the methodology proposed by Tranfield, Denyer, & Smart (2003). Chapter 3 presents a descriptive analysis on the general characteristics of the 32 included studies. Chapter 4 presents a thematic analysis on the theoretical findings. Here, all the relevant findings are synthesized and combined into one complete collection of information. Chapter 5 draws a conclusion on the literature study by identifying the research gap and defining a challenging but feasible research question for the master thesis project: *How are intermediaries in the Dutch renewable energy market organized to stimulate high-growth firms?*
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1. Introduction

This systematic literature review serves as a preparation for the master thesis project of Joep Sinke. This master thesis is the final stage of the master study Innovation Management at the Eindhoven University of Technology. The master thesis project aims to create new insights in the understanding of the determinants of success and failure associated with the growth potential of young renewable energy firms and their contribution to the energy transition.

In order to develop a comprehensive master thesis it is important to evaluate the existing academic literature on this research topic. The systematic literature review is executed based on the approach presented by (Tranfield et al., 2003). The literature review aids to deliver an overview of the scientific enhancements regarding three fundamental concepts central to this research; energy transition, high-growth firms, intermediaries. The goal of the review is to identify a research gap and a corresponding research question for the final master thesis project.

1.1. Topic

The exhaustion of fossil fuels and the climate change mitigation have become major challenges for governments all over the world in recent years. To engage this challenge, many countries are pursuing the research, development, and demonstration of renewable energy sources (Shen, Chou, & Lin, 2011). Policy makers, organizational leaders and researchers agree that sustainable entrepreneurship is essential for the energy transition from a fossil-based market to a more renewable energy market. Shepherd & Patzelt (2017) describe sustainable entrepreneurship as the discovery, creation and exploitation of opportunities to create future goods and services, which sustain the natural and communal environment and provide improvement for others. Schaltegger & Wagner (2011) emphasized the importance of sustainable entrepreneurship and described it as the most consequent form of environmental management since sustainable entrepreneurial companies create modes that substantially reduce environmental impacts and increase the quality of life. These sustainable entrepreneurial companies go beyond the incremental improvements made by established companies.

Policymakers however, fail to acknowledge the need for research on the growth stages of these firms. Shane (2009) emphasizes this by stating that entrepreneurship has been an important policy focus for decades, but explicit focus on high-growth entrepreneurship is much more recent. Generally, growth is conceptualized as a firm’s progression from an early stage of exploring ideas and formulating business plans via an intermediate stage of refining ideas and implementing business plans to a final stage of expanding operations and scaling a business (Dutt et al., 2016). Many young firms fail to develop into prosperous high-growth businesses. According to Eisenhardt & Schoonhoven (1990), economic prosperity and sustainability is only reached when a young firm transcends the emergence stage and successfully reaches a long-term growth stage, and even more desirable, a stage of high-growth. Isenberg & Fabre (2014) emphasize this by stating that relatively high-growth ventures are often at least 16 years old, and are disproportionately high drivers of jobs, growth, value, and sustainability. Therefore, these high-growth businesses seem to have a
large impact on the speed of the energy transition. Long-term renewable energy production, delivery and management are precarious without a good understanding of the growth stages.

In transitions of large sociotechnical systems, intermediary organizations can emerge as mediators in between several actor groups and facilitate collaboration towards common goals (Backhaus, 2010). Intermediaries are organizations that aim to increase both the survival and growth rate of new and existing firms. Dutt et al. (2016) consider intermediaries as agents that link two or more parties to bring about specific activities. High-growth entrepreneurship has been increasingly drawn into policy focus, as governments have recognized that not all new firms contribute equally to the economy. This has contributed to an increased interest in policy initiatives specifically targeted at facilitating high-growth entrepreneurial activity (Autio & Rannikko, 2016). However, we still have limited understanding about the role of an intermediary for realizing growth and high-growth firms in the sustainable energy market. Examples of intermediaries are trade associations, private equity investors or business, government or university incubators. In this literature review, the focus lies specifically on ‘energy intermediaries’ that act as an agent for young renewable energy firms. Research into the reasons of successes and failures of intermediary work and a theoretical corroboration for their practical work can help intermediaries to improve their program designs and implementation strategies (Backhaus, 2010).

This research characterizes itself through the combination of three different research themes; energy transition, high-growth firms and intermediaries. The literature review aims to develop a clear understanding of the individual themes, their matching characteristics and possible relationships. Thereby it aims to define a relevant research gap and to define a challenging but feasible research question.

1.2. Problem definition
This systematic literature review will serve to define the eventual research scope of the master thesis project. Thereby it aims to determine three important aspects; defining a relevant research gap, defining a challenging but feasible research question, a clear definition of the three main research themes: energy transition, high-growth firms, intermediaries. The analysis focuses on what is written in the literature about the individual themes, their matching characteristics and possible relationships. The following two questions will be answered by this literature review:

What is described in the literature about the individual characteristics of the three research themes, - energy transition, high-growth firms and intermediaries – and the possible relationships between them?

How does the literature contribute to the defining of a challenging but feasible research question for the master thesis project?
2. Methodology

As described, a systematic literature review will be conducted. A systematic literature review is preferred over a traditional ‘narrative’ review since these often lack rigor and can be biased by the researcher (Tranfield et al., 2003). In contrast, systematic reviews use a more rigorous and well-defined approach to reviewing the literature in a specific subject area (Cronin, Ryan, & Coughlan, 2008). The systematic review approach used for this research is based on the principles presented by Tranfield et al. (2003). They distinguish three different stages of a systematic review in their study; (1) Planning the review, (2) conducting the review and (3) reporting and dissemination.

2.1. Planning the review

The planning of the review consists of the identification for the need for a review, the preparation of a proposal for a review and the development of a review protocol. The identification for the research need has been performed together with an expert in the field of academics on the nexus of entrepreneurship and technology innovation. An explorative reading has been performed based on a pool of literature provided by the expert (Appendix A). This pool contained a total of twenty academic papers related to the different research themes. These papers suggest an interesting research direction on the possible combination of the different research themes. This identification helps to scope the research and thereby limits the subject area. The outcomes of the explorative research are translated into the introduction part of this literature review, completed with a clear problem definition. This introduction should be read as the proposal for this literature review. Further, as part of the research preparation, a process planning of the review approach is presented. Figure 1 presents this process planning and indicates that the research topic and problem definition are established after the explorative search. The literature review starts with the explicit search and selection criteria and describes how the process ought to be documented. To limit researcher bias, this literature review clearly reports decisions about the number of papers excluded, new exclusion criteria and basic details of excluded studies, such as underlying reasons for exclusion. A first screening is based on the title, a second screening is based on the abstract and a third screening is an evaluation of the quality of the research based on the content of the article.

![Figure 1: Process planning of the research approach based on Tranfield, Denyer & Smart (2003)](image-url)
The literature will be searched via an online database for academic studies. The database selected for this systematic review is Clarivate Analytics’ Web of Science (www.webofscience.com). This database is preferred because they include only peer-reviewed studies (Science Citation Index) and provide a finite list of results based on queries. Google Scholar is not used as a search engine because it provides an infinite list of studies resulting in too many, and thereby partially irrelevant, results. Web of Science has its own abstract and citation database, meaning that they carry more information on every study.

2.2. Conducting the review

The conducting of the review consists of the identification of the research, making a selection of studies, doing a quality assessment of these studies, extracting the data and documenting the progress and building a data synthesis (Tranfield et al., 2003). We conduct the review with identifying keywords and search terms, which are derived from the topic description and research scope. Within our research we distinguish three major topics; sustainable energy, high growth firms and intermediaries. The initial search contained a combination of the three research themes (Figure 2). However, there were no sufficient results, indicating an underdeveloped field of research and a possible research gap. Despite this interesting indication no sufficient studies were found.

The second search contained of three different search queries combining two research themes at a time (Figure 3). A first scan of the results indicated sufficient findings for two of the three theme combinations. However, the combination between energy transition and high-growth firms showed insufficient results. This implies that the search is too specific combining these two research themes. Academics have not still devoted themselves in examining the role of high-growth firms within the energy transition. As such in our current study, the term “high-growth firms” might be too specific and we decided to combine the research theme energy transition with a broader umbrella research theme; entrepreneurship. Hence, the final search contained the combination of the research themes energy transition and intermediaries, intermediaries and high-growth firms and energy transition and entrepreneurship (Figure 4).

![Figure 2: Initial combination of research themes](image1.png)

![Figure 3: Second combination of research themes](image2.png)

![Figure 4: Final combination of research themes](image3.png)
Table 1 provides an overview of the selected search terms per research theme. These search terms are used to construct queries to execute the search on Web of Science. A term that is between quotation marks implies that an exact match with the entered words is demanded. A term with an asterisk (*) behind it implies that it will search on variations of the terms, e.g. entrepreneur* refers, inter alia, to entrepreneurs and entrepreneurship. In total, three different queries are constructed. An example of this combination process for research themes energy transition and entrepreneurship is shown in table 2. The full combination of search queries can be found in Appendix B.

Table 1: Overview of research themes and selected search terms

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Research theme</th>
<th>Search terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy transition</td>
<td>“Energy transition” OR &quot;Renewable energy&quot; OR &quot;sustainable energy&quot;</td>
</tr>
<tr>
<td>2</td>
<td>High-growth firms</td>
<td>“High growth firms” OR &quot;High growth entrepreneurship&quot; OR &quot;High growth enterprises&quot; OR Scale-ups OR Gazelles OR &quot;High growth venture&quot; OR &quot;High growth&quot;</td>
</tr>
<tr>
<td>2.0</td>
<td>Entrepreneurship</td>
<td>Entrepreneurship OR &quot;Scale-ups&quot; OR Gazelles OR “Start-ups”</td>
</tr>
<tr>
<td>3</td>
<td>Intermediaries</td>
<td>Intermediaries OR Incubator OR Accelerators OR “Business incubators” OR “Entrepreneur* policy”</td>
</tr>
</tbody>
</table>

Table 2: Combination of search query for research theme 1 and 2.0

<table>
<thead>
<tr>
<th>Search terms of research theme 1</th>
<th>Search terms of research theme 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Energy transition&quot;</td>
<td>Entrepreneurship</td>
</tr>
<tr>
<td>&quot;Renewable energy&quot;</td>
<td>&quot;Scale-ups&quot;</td>
</tr>
<tr>
<td>&quot;Sustainable energy&quot;</td>
<td>Gazelles</td>
</tr>
<tr>
<td>&quot;Start-ups&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;Energy transition&quot; AND &quot;Renewable energy&quot; AND &quot;Sustainable energy&quot; AND &quot;Start-ups&quot;</td>
<td></td>
</tr>
</tbody>
</table>

The search resulted in a full list of 251 articles that were prepared for further screening. A quality assessment is executed to exclude studies of insignificant quality. This is done based on set inclusion and exclusion criteria (Table 3). These criteria are set to select only the relevant studies that are available to us. We followed the planning as described on page 6. After a title and abstract screening 216 studies turned out to be irrelevant. Additional 3 studies were excluded after a complete reading of the studies. The remaining 32 studies were included in our review. Table 4 presents an overview of hits per combination of research themes and total amount of papers indexed throughout the screening. After the
initial screening and assessing of the studies some additional papers were included based on expert suggestions.

Table 3: Inclusion and exclusion criteria

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic of study is relevant to the defined themes</td>
<td>Topic of study are irrelevant to the defined themes</td>
</tr>
<tr>
<td>Documents written in English</td>
<td>Focused on a very specific industry</td>
</tr>
<tr>
<td>Document is available online</td>
<td>Single focus on developing countries</td>
</tr>
</tbody>
</table>

Table 4: Hits per combination of research themes and total amount of papers indexed

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Research theme</th>
<th>Number of Hits</th>
<th>Title &amp; abstract screening</th>
<th>Quality assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2.0</td>
<td>Energy transition &amp; entrepreneurship</td>
<td>133</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>1 &amp; 3</td>
<td>Energy transition &amp; intermediaries</td>
<td>83</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>2 &amp; 3</td>
<td>High growth firms &amp; intermediaries</td>
<td>35</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>251</td>
<td>35</td>
<td>32</td>
</tr>
</tbody>
</table>

2.3. Reporting and dissemination

The reporting and dissemination part of the study concerns the presentation of the study findings. These findings will be presented in the analysis part of this review and consists of two different stages. First, a descriptive analysis of the indexed studies is given. Herein, more general information is described; e.g. author information, age profile of articles, related industry, energy type. Second, a thematic analysis is given where the theoretical findings of the studies are presented. This process start with a synthesis of all the indexed papers, these tables are presented in Appendix C. Next, all relevant findings are described and the themes are linked across the various core contributions and emerging themes and research questions will be described.
3. Descriptive analysis

In this section we discuss the descriptive findings of our literature review. More general characteristics of the 32 studies extracted from Web of Science are highlighted. A complete overview of the articles and their characteristics can be found in Appendix D. It is observed that the studies are distributed widely across leading management, business and entrepreneurship journals. The studies originate from 24 different journals and include two conference papers. Journals that contributed two papers are Entrepreneurship & Regional Development, Journal of Business Venturing, Renewable and Sustainable Energy Reviews, Research Policy, Technological Forecasting & Social Change and Technovation.

Figure 5 shows the number of articles published per year and reveals some interesting insights. There is only one paper published before 2007, the paper of Feeser & Willard (1989). An increasing interest in these research themes can be observed since the majority of the papers are published in the last ten years and seventeen papers are published in the last two years. The most cited paper is Hockerts & Wüstenhagen (2010) on greening Goliaths and emerging Davids, cited 149 times being an average of 16.56 per year.

![Figure 2: Number of articles published per year](image-url)
4. Thematic analysis
In this section we discuss the theoretical findings of our literature review. The findings are divided into four main chapters; intermediaries, energy transition, sustainable entrepreneurship, and high-growth firms. Every chapter starts with a definition of the particular topic and introduces the subjects described.

4.1. Intermediaries

Definitions
Innovation intermediaries are central actors in innovation processes (Howells, 2006). They aim to increase both the survival and growth rate of new and existing firms through facilitating knowledge and technology transfer between different firms. Intermediaries are agents that link two or more parties to bring about specific activities (Dutt et al., 2016). In transitions of large sociotechnical systems, intermediary organisations can emerge as mediators in between several actor groups and facilitate collaboration towards common goals. They can support the establishment of new actor networks and the articulation and alignment of interest to bring about desired changes (Backhaus, 2010). Intermediaries play a leading role in bridging institutional knowledge gaps between government and industry, and between local and global (Watkins, Papaioannou, Mugwagwa, & Kale, 2015). Intermediaries can be individuals, organizations or platforms and their activities often go beyond being knowledge brokers or networkers. They can also stimulate innovation through education, organizing and distributing financial and human resources, assessing new technologies, creating partnerships, and affecting regulations and policies. Additionally, intermediaries can have a strong negotiation position and can influence the way in which the innovation occurs when it reaches the consumer (Martiskainen & Kivimaa, 2017). A distinction in intermediaries is made between incubators and accelerators. Incubators are focused on producing and assisting start-ups and accelerators are focused on existing and established firms with significant growth potential (Brown & Mawson, 2016). It is recognized that intermediaries operate along a wide range of industries. The studies included in this literature review all discuss energy intermediaries. The energy intermediaries act as agents for renewable energy firms. The studied literature briefly describes buffering and bridging activities of intermediaries (Autio & Rannikko, 2016; Buckley & Davis, 2016) and the process of intermediaries throughout history (Watkins et al., 2015). Additionally, their influence on resolving the collective actor problem is mentioned (Martiskainen & Kivimaa, 2017; Webb & Hawkey, 2017).

Buffering and bridging activities
Intermediaries provide two broad sponsorship functions; buffering and bridging (Autio & Rannikko, 2016; Buckley & Davis, 2016). Buffering is referred to as the provision of support that provides a safe place for firms to develop their internal resources. Thereby aiming to protect young firms against adverse effects of internal resource scarcity and external resource dependencies. Resources can include an office space, financial subsidies, training and consulting and tax breaks. Bridging facilitates the connectivity of new firms with important external stakeholders. This may include networking, branding, field building, and tie facilitation with outside investors (Amezcua, Grimes, Bradley, & Wiklund, 2013).
Fundamentally, buffering and bridging activities aim to enhance resource constraints and reduce resource dependencies.

**Process of intermediaries**

A literature study on National Innovation Systems (NIS) and the changing role of intermediary management is presented by Watkins et al. (2015). These National Innovation Systems are defined as a set of national institutions which contribute to generation and diffusion of new technologies and which provide the framework within which governments and firms negotiate policies to influence the innovation process (Watkins et al., 2015). Despite that the study of Watskins et al. (2015) is mainly focused on developing countries, it gives interesting insights in the process of the National Innovation Systems and the parallel yet increasing coinciding body of work on the role of intermediaries. They identify three different shifts over time.

The first body of literature includes studies from 1982 till 1993 and describes a shift away from macro institutional explanations to a focus on specific system processes. This body of literature has a limited reference to intermediaries and there is no clear identification of their role and functions. The second shift is defined in studies ranging from 1995 till 2000 and places more emphasis on the role of intermediary and non-governmental actors. The importance of network organisations and knowledge transfers towards innovation is stressed increasingly. The third shift covers literature from 1999 till 2012 and grows emphasis on the internationalisation of innovation systems focussing more on the role of multinational companies and global knowledge flows and markets. These studies convincingly display that effective National Innovation Systems demand substantial inward knowledge flows and connections to innovation capacities located in other countries. Accordingly, it is emphasized that intermediaries are found to be important actors in creating stable business environments through working closely together and negotiate with governments (Watkins et al., 2015). The presented literature review explains the emergence of intermediary management within academic literature over the past forty years that can be used as a good starting point for our study.

**Resolving the collective actor problem**

The publication of Webb & Hawkey (2017) takes a material sociology perspective towards the energy transition and mentions the so called ‘collective actor problem’. The development of energy networks will get involved with this problem since these networks are dependent on the integration of numerous independent innovations (e.g. technical products, applications, services). These independent innovations have to work collectively in order to perform new functions or improve the overall performance (Martiskainen & Kivimaa, 2017). This can be achieved through long-term collaboration between energy suppliers, distributers, retailers and consumers to secure the envisioned benefits from energy and cost savings. However, the benefits are not limited to direct actors in development and these actors may find the cost-benefit ratio not sufficient. There is a possibility for the actor to free ride on the willingness of other actors to take their responsibility. When all the actors adopt this rationally self-interested position, the common benefits are lost. The study stresses that this problem is very difficult to resolve. However, combinations of public planning, regulation and ownership have been used throughout the past to reduce the problem (Webb & Hawkey, 2017). The role of intermediaries can be fundamental in the support of these solutions.
4.2. Energy transition

Definitions
Climate change has become one of the greatest global challenges and it is largely identified as the most important environmental problem facing our globe (Houda & Triki, 2014). To engage this challenge, many countries are pursuing the research, development, and demonstration of renewable energy sources (Shen et al., 2011). An energy transition from a fossil-based market to a more renewable energy market has widely been proposed as the solution for future sustainability. An energy transition is defined as “a particularly significant set of changes to the patterns of energy use in a society, potentially affecting resources, carriers, converters, and services” (O’Connor, 2010). Sustainable development is needed to change the patterns of energy use in our society. Gasbarro, Annunziata, Rizzi, & Frey (2017) define sustainable development as the means of meeting the needs of current generations without threatening the ability of futures generations to meet their own needs. It offers a vision of progress that integrates immediate and longer-term objectives, local and global actions, and regards social, economic, and environmental issues as inseparable and interdependent components of human progress.

The studied literature briefly describes the role of uncertainties present within the renewable energy sector. Scholars have mostly focused on the impact of uncertainties on entrepreneurial activity in the renewable energy industry (Erikson et al., 2015; Meijer et al., 2010). Furthermore, renewable energy support systems and policies have received great attention, including their positive influence on firm growth (Ahrens, 2017; Erikson et al., 2015; Georgallis & Durand, 2017; Kivimaa, Kangas, & Lazarevic, 2017) and their potentially negative effect on innovativeness and diffusion (Balachandra, Salk, Nathan, & Reddy, 2010; Doblinger, Dowling, & Helm, 2016). Subsequently, the role of intermediaries in the energy transition is described (Martiskainen & Kivimaa, 2017; Polzin, Von Flotow, & Klerkx, 2016; Sperling, 2017). Finally, different scholars propose a system perspective towards the adoption of renewable energy technologies (Johnson & Suskewicz, 2009; Polzin et al., 2016; Watkins et al., 2015).

Uncertainties
Meijer et al. (2010) present a case study on the biomass industry in the Netherlands. They aim to understand how perceived uncertainties in this sector influence entrepreneurial action. The most important factors that could hinder the diffusion of renewable energy technologies are political uncertainty, technological uncertainty and resource uncertainty. The scholars stress that both the internal and the external environment of a project can significantly affect the entrepreneur's perception of uncertainties, motivation and entrepreneurial action. These internal and external interactions may influence the balance between perceived uncertainties and motivation. Meijer et al. (2010) emphasize that political uncertainty is also hindering investments in sustainable energy technologies. Uncertainty about the availability of financial resources is often influenced by the perceived uncertainties of investors about the technology, the availability of resources and governmental policies. Governments can help prevent negative interaction patterns by reducing perceived political uncertainty. The study of (Erikson et al., 2015) stresses the relative importance of various types of value capturing heuristics used by entrepreneurs in an emerging industry with high levels of uncertainty. Their results show that for newly
established technology-based firms within these industries, business development is more important for value capture than predominant focus on technological development.

**Support systems & policy**

The renewable energy market is an emerging industry and still largely dependent on public policy stimulating technology demand, such as feed-in-tariffs or quota obligations (Ahrens, 2017; Bjornali & Ellingsen, 2014; Doblinger et al., 2016). These policies might act as effective drivers of long-term innovation and success in the renewable energy industry (Marra, Antonelli, & Pozzi, 2016). Policy makers therefore are highly motivated to accelerate the developments and commercialization of new renewable energy solutions (Erikson et al., 2015). The governments’ role in shaping the business environment is pervasive and aims to promote productive investments in a way that would not occur in market interactions free of such interventions (Lazzarini, 2015). Government policies to promote renewable energy must include both supply-push and demand-pull policies during the period covering pre-commercialization, and support commercialization (Norberg-Bohm, 2000). Supply-push policies are installed to stimulate innovation activities at the firm level, such as grants or tax credits for firm investments in research and development (R&D). Demand-pull policies are installed to promote technology on the demand side. Generally stressed by increasing the payoff for technology investments, such as feed-in-tariffs, quota obligations or long-range targets, which reward technological and efficiency improvements (Balachandra et al., 2010).

Georgallis & Durand (2017) examine which firms achieve high-growth in policy-dependent industries and make a distinction between start-ups and corporate firms. They find that producers’ growth is positively related to policy generosity, and negatively linked to policy discontinuity. Hereby, policy generosity is explained as the attractiveness of the policy support system. Policy discontinuity is explained as the inability to predict the future state of the regulatory environment that diminishes a firm’s willingness to invest in growth initiatives and therefore hinders diffusion. Additionally, Georgallis & Durand (2017) find that corporate firms are less affected by policy generosity and discontinuity compared to startups. Kivimaa et al., (2017) suggest a broader perspective towards policy management. They recognize a trend in the literature that moves away from analyzing narrow, specifically designed portfolios of policy goals. The focus increases towards broader mixes of policies (Kivimaa et al., 2017). This broad perspective might accelerate the diffusion of complex technologies since they cross many different domains and industries.

A common example of successful transition management towards renewable energy is Germany. The study of Ahrens (2017) shows the German way towards renewable energy production and highlights important steps for this transition. At the start, the transition was focused on growth and market access to achieve leverage. This resulted in higher affordability for investors and decreased criticism. The most essential steps for this transition seemed to be start-ups with relevant and reliable feed-in tariffs and other crucial side effects such as social and ecologic motivation. The chosen approach was focused on decentralization and implemented through the mobilization of many single producers and consumers that created a swarm of production sites of green electricity. Another essential step was the creation of regional smart grids and a national grid structure with sufficient capacity. These intelligent connections enable the digital future of renewable energy (Ahrens, 2017).
Critiques
Among the great attention renewable energy policies have received from scholars the potentially negative effect on innovativeness and diffusion have also been mentioned. The study of Doblinger et al. (2016) shows that public policies can constrain firm innovativeness and risk-taking behavior because they steer firms towards a more conservative attitude and discourage the pursuit of high-risk innovation. Another critique is focused on subsidy mechanisms for sustainable energy technologies. These are oriented towards one-time demonstration rather than its diffusion and therefore acts more as market ‘distortion’ instead of ‘attraction’ (Balachandra et al., 2010). Firms that have satisfied the technological requirements of the policies are not stimulated to continue committing resources to developing products and technologies. Doblinger et al. (2016) stress the need for a strong balance between supply-push and demand-pull policies to enable radical innovation and sustainable industry growth. Erikson et al. (2015) also emphasize the importance of support continuity. Not only supporting research and development, also encouraging early stage funding and international business cooperation to a larger extend. This will not only increase the probability for successful commercialization, but will also contribute to increase the global diffusion of renewable energy innovations (Erikson et al., 2015).

An argument often claimed by citizens of transitioning countries is that electricity production is too highly dependent on subsidies such as feed-in tariffs. However, leading scholars claim that the plunging costs of technology will sweep away political inertia and the resistance of vested interest (Parkinson, 2015). As soon as the major technology breakthrough has been achieved, the global energy transition will be unstoppable (Ahrens, 2017).

Role of intermediaries in the energy transition
Myriad actors are involved in the energy transition and a wide range of these actors can become intermediaries or champions according to Martiskainen & Kivimaa (2017). Intermediaries are defined as actor that create spaces and opportunities for others and mediate, make connections and enable relationships between different parties (Martiskainen & Kivimaa, 2017), thereby facilitating knowledge and technology transfer between different firms. These intermediaries could potentially perform crucial activities that support the acceptance of system innovations (Martiskainen & Kivimaa, 2017). Innovation champions are described as individuals who actively and enthusiastically promote innovations through the crucial organizational stages. These individuals help to overcome the social and political burdens enforced by an organisation and change them to its advantage (Howell, Shea, & Higgins, 2005). Some intermediaries take also championing roles, while other actors champion projects when intermediation is absent (Martiskainen & Kivimaa, 2017).

As mentioned above, intermediaries can also stimulate innovation through organizing and distributing financial resources. Polzin et al. (2016) strain the importance of institutional innovation intermediaries with specific finance mobilisation functions. The scholars emphasize the importance of the incorporation of the finance perspective at an early stage in the development process of renewable energy technologies. Collaboration between innovative firms, research institutes and financiers could leverage public and private funds more effectively, improve innovation activity and speed-up the commercialization and diffusion process (Polzin et al., 2016). Mowery, Nelson, & Martin (2010) view the persistent information asymmetry between innovator and financiers in the renewable energy sector as
a large potential for connecting public support with private finance. Institutional intermediaries play a crucial role in the reduction of this information asymmetry through establishing and governing a closer collaboration in fostering knowledge flows between innovators and financers. The findings of Polzin et al. (2016) confirm that a financial innovation system that underlies national and technological innovation systems is a significant driver of innovation.

Sperling (2017) stresses another important role of intermediaries, being the alignment of the external and internal context. Sperling (2017) performed a case study on the island of Samsø in Denmark that is famous for its fast transition from brown to green energy. The study looks at the contextual conditions that contributed to the success. A distinction between external and internal contextual conditions is made. External contextual conditions are identified by guiding visions and plans, governmental technology support, governmental process support, and expert assistance. Internal contextual conditions include local traditions and history of cooperative projects, guiding visions and plans, sense of loyalty and responsibility, community spirit, entrepreneurial individuals and networks. For these constructive contextual conditions to contribute to a successful project, alignment through intermediaries is important (Sperling, 2017).

**System perspective**

Different studies stress the importance of a system perspective towards the adoption of renewable energy technologies (Johnson & Suskewicz, 2009; Polzin et al., 2016; Watkins et al., 2015). They strain that there lays a fundamental error in focussing on parts rather than on the whole. The energy transition is dependent on many different independent innovations with myriad actors involved. This means that a system innovation perspective is demanded. This requires more support from intermediaries than modular innovations, particularly in the diffusion phase (Martiskainen & Kivimaa, 2017). Successful economic development is intimately linked to a country’s capacity to acquire, absorb, disseminate, and apply modern technologies (Watkins et al., 2015). Watkins et al. (2015) mention seven primary function that are supported by effective innovation systems; *entrepreneurial activities, collective learning, knowledge diffusion through networks, technology selection, market formation, resource mobilization, technology legitimacy*. Positive fulfillment of these functions and interaction between them will lead to innovative activity and a lack of a function fulfillment or interaction will lead to system inefficiencies and failures. Hence, positive fulfillment of these functions requires a broad perspective towards a countries national innovation system. Polzin et al. (2016) also strain the importance of the broader perspective by stressing that policymakers should consider financial barriers and related technological, cooperative and regulatory or political barriers as intertwined. Johnson & Suskewicz (2009) complement their proposed broad system perspective with a system that consists of four interdependent and mutually reinforcing components; an enabling technology, an innovative business model, a careful market-adoption strategy, and a favourable government policy. This proposed system clearly brings the described findings of different scholars together.
4.3. Sustainable entrepreneurship

Definitions
Entrepreneurs have a prime role in helping our society transition towards a sustainable environment. Their actions determine whether or not renewable energy technologies are successfully developed and implemented (Meijer et al., 2010) and they are essential for a well-functioning innovation system (Brown & Mason, 2014). There are several definitions of entrepreneurship presented by scholars that help understand their role in the energy transition. A consistent characteristic is that entrepreneurship is related with ‘something new’ (Terjesen, Bosma, & Stam, 2016). More specifically, Dean & McMullen (2007) define sustainable entrepreneurship as “the process of discovering, evaluating, and exploiting economic opportunities that are present in market failures which detract from sustainability, including those that are environmentally relevant”. Individual factors of the entrepreneur have also been studied in literature. However, no studies are found that examine specific personal characteristics of the founding entrepreneurs and their effect on the performance and growth of young renewable energy firms. The individual factors that are well described in the literature are entrepreneurial identity (Houda & Triki, 2014; York, O’Neil, & Sarasvathy, 2016), entrepreneurial commitment (Gasbarro et al., 2017; Marcus & Anderson, 2010; Meijer et al., 2010) and entrepreneurial skills (Brandt & Svendsen, 2016; Gasbarro et al., 2017; Marcus & Anderson, 2010). Some studies have examined firm-specific factors, covering topics as firm types (Gasbarro et al., 2017), industry network ties (Doblinger et al., 2016; Marra et al., 2016) and commercial strategies (Balachandra et al., 2010; Walsh, 2011). The growth process of firms has a significant impact on the speed of the energy transition. Scholars have studied the concept of this sustainable growth and describe the distinctions concerning the measurement of sustainable firm growth (Brandt & Svendsen, 2016; Hockerts & Wüstenhagen, 2010; Houda & Triki, 2014; Mulder, 2008; York et al., 2016). Additionally, different types of firms are described together with their role in the energy transition (Brandt & Svendsen, 2016; Hockerts & Wüstenhagen, 2010; Süsser, Döring, & Ratter, 2016).

Individual factors

Entrepreneurial identity
Scholars have examined different entrepreneurial types, motivations and skills needed to engage in environmental entrepreneurship (Houda & Triki, 2014; York et al., 2016). York et al. (2016) link entrepreneurial identity to venture goals and stakeholder incentives in order to understand why and how individuals engage in environmental entrepreneurship. Their findings suggest three things. First, environmental entrepreneurs are motivated in both commercial and ecological logics. Second, the prioritization of commercials and/or ecological venture goals depends on the strength and priority of coupling between the two identity types. Third, environmental entrepreneurs approach stakeholders in a broadly inclusive, exclusive, or co-created manner based on identity coupling and goals. Meaning that the entrepreneur decides to involve a specific stakeholder depending on their ecological, commercial or blended identities. These identity types relate to the personal factors that Houda and Triki (2015) describe in their study on the motivations of entrepreneurs to undertake the renewable energy sector. Personal factors influencing the initial conditions are sustainable orientation (interest of individual to pursue initiatives and to form business
which supports the idea of sustainability), motivation (desire to make the world a better place to live) and cognitive factors (competences, vision, innovativeness).

**Entrepreneurial commitment**

When organizational fields are well established, entrepreneurial commitment and motivation is likely to be high, but for emerging fields takeoff is difficult because there are many uncertain prospects to success. The internal and external environment of a project can significantly affect the entrepreneurs’ perception on uncertainties, motivation and entrepreneurial action. These internal and external interactions may influence the balance between perceived uncertainties and motivation positively or negatively (Meijer et al., 2010). The study of Marcus & Anderson (2010) builds on the theory of enactment of Danneels (2003) to explain the entrepreneurial commitment to emerging fields relevant to business and society, like renewable energy, despite the uncertainties. Marcus & Anderson (2010) explain this commitment by the means of the affect of actions that entrepreneurs undertake on their commitment through their effects on beliefs. The actions entrepreneurs take to influence stakeholders shape the perceptions of the entrepreneurs, which in turn strengthens the entrepreneurs’ commitment to the field. Their actions strengthen their beliefs that the industry is attractive and that they have something valuable to offer, an excellent product or service. As these beliefs strengthen, the entrepreneurs’ commitment to the industry increases (Marcus & Anderson, 2010).

Gasbarro et al. (2017) also emphasize a catalytic role that co-evolutionist sustainable entrepreneurs play in sustainable development and link this to the important role of regional political actions. Co-evolution means that key actors have a significant causal impact on each other’s ability to persist. They identify four different types of sustainable entrepreneurs (hero, visionary, bandwagoner, and explorer) that correspond to the different levels of interaction with public authorities and system levels of action.

**Entrepreneurial skills**

In their categorization of sustainable entrepreneurs Gasbarro et al. (2017) distinguish between top-down or bottom-up governance for interplay between policy makers and entrepreneurs. Top-down governance is aimed at implementing public policies where bottom-up governance is aimed at triggering the energy transition in the target market (Gasbarro et al., 2017). Brandt & Svendsen (2016) specifically focus on the bottom-up initiatives characterized by local environmental entrepreneurship. They consider four entrepreneurial skills of which two must be present to be successful. The first of which is the ability to secure the high private financial performance of a given environmental management the delivery of a sufficiently green component. The second and third are coordination and persuasion skills covering the ability to bring important stakeholders together and convince them. These two skills are also stressed by Marcus & Anderson (2010) and seen as critical in the process of educating the stakeholders. The fourth skill identified is trustworthiness, so that stakeholders will trust the entrepreneur to be able to deliver a profitable solution (Brandt & Svendsen, 2016).
Firm-specific factors

Firm types
As mentioned earlier Gasbarro et al. (2017) distinguish between top-down or bottom-up governance for interplay between policy makers and entrepreneurs. They make a distinction between an innovative regime and niche actors instead of the distinction that is often made between incumbent or corporate firms and new entrants or start-ups (Georgallis & Durand, 2017; Hockerts & Wüstenhagen, 2010; Johnson & Suskewicz, 2009; Walsh, 2011; York et al., 2016). An innovative regime operates at the meso-level and a niche actor operates at the micro-level.

Network ties
Two studies mention the importance of strong network ties between firms and with research associations to enhance their innovativeness (Doblinger et al., 2016; Marra et al., 2016). A network is described as the connections and collaboration between different types of firms (e.g. suppliers, buyers and competitors) as well as research and trade organizations. These collaborations could facilitate a firm’s tendency to commit considerable resources for investments in new technologies. Marra et al. (2016) execute a network analysis of green-tech firms in San Francisco, New York and London and mention the informative basis of a network analysis. They stress that the proposed method is a helpful exploratory tool and helps to address some key policy issues. These policies might act as effective drivers of long-term innovation and success in the green-tech industry. Additionally, these policies could identify and direct active industry players and financial institutions towards emerging complementary businesses, products and technologies that help to create additional demand for given services and to attract innovative firms, talents and competences. Lastly, these policies could stimulate competence building and facilitate closer relationships between parties within the green-tech industry.

Doblinger et al. (2016) distinguishes between intra-industry and extra-industry business ties. Intra-industry ties are a reputable foundation of resources and contribute to an alignment of views and entrepreneurial decision-making processes between these firms. This tendency for shared industry views and the normative pressure to comply with common industry practices suggests that intra-industry ties frequently lead to a reinforcement of dominant industry practices. These ties thereby help to gain first-hand information on key industry developments, which support the pro-activeness of a firm and help them to anticipate to market trends (Yang & Dess, 2007). However, the access to novel knowledge from outside the industry is limited, which hinders a firm’s innovativeness (Stam & Elfring, 2008). The study of Doblinger et al. (2016) shows that the stronger a firm’s intra-industry business ties, the higher its level of pro-activeness. Their hypothesis that was in line with the research of Stam & Elfring (2008) indicating that the strong intra-industry business ties result in lower levels of innovativeness is not supported. The extra-industry ties concern the network links outside the focal industry with research institutes, trade organizations and government agencies. These parties act as bridges between various firms from other industries and technological areas, which allow them to share information from variable sources. These information flows from outside the focal network can bring in novel knowledge that stimulates creative insights and ideas for potentially radical new (Walsh, 2011)
advancements that enable firm innovativeness (Stam & Elfring, 2008). The study of Doblinger et al. (2016) shows that the stronger a firm’s extra-industry research ties, the higher its level of pro-activeness and innovativeness.

**Commercial strategies**

Another firm specific factor that is discussed in the literature is the commercial efforts to diffuse sustainable energy technologies. These commercial strategies have so far remained as the biggest challenge in the field of renewable energy (Walsh, 2011). Walsh (2011) looks at the commercialization strategies for small and medium renewable energy enterprises and determines different environments that impact the choice of commercialization strategies. Balachandra et al. (2010) review the existing state of commercialization of sustainable energy technologies in India. Thereby they build on Rogers theory of diffusion and present some interesting insights that help to diffuse sustainable energy technologies (Rogers, 1995). They also state that, despite some environmental technologies that are (becoming) profitable, there has not been an overwhelming inflow of human and financial capital into the renewable energy sector. Thereby, they stress the importance of our research by stating that “the energy revolution is still waiting to happen” (Balachandra et al., 2010). Balachandra et al. also express their concerns about climate change in developing countries because these countries, though not primarily responsible, are most vulnerable to climate change impacts and have fewer resources to adjust socially, financially and technologically. Another important factor in creating a sustainable environment is not only the diffusion of the technology itself but also the diffusion of these technologies in the market that has to be sustainable. Only then full economic, health and environmental benefits can be reached (Balachandra et al., 2010). A critique presented in the article concerns the current subsidy mechanism for SETs, which is oriented towards one-time demonstration rather than its diffusion. Thereby the finance and facilitation stops once the successful demonstration is accomplished. Another interesting insight presented in their paper links directly to Rogers diffusion theory (Rogers, 1995). This theory divides consumers into groups. The first two are innovators (2,5%) and early adopters (12,5%) that together are referred to as potential adopters. In the context of commercialization of sustainable energy technologies these potential adopters can be treated as diffusion channels to reach even more consumers. It is stressed that among these potential adopters there would be chosen techno-entrepreneurs, who want to start small-scale businesses to use and diffuse products and services based on sustainable energy technologies.

Besides the technological change, business model innovations can play a crucial role in stimulating the energy transition (Johnson & Suskewicz, 2009; Kivimaa et al., 2017). Johnson & Suskewicz (2009) stress that many investments are and have been done into renewable energy companies using conventional business models, and this rarely works. The energy transition demands a major infrastructural shift. This does not only involve technologies to be replaced by better technologies, rather, complete systems to be replace by new systems. These new technological paradigms require business models designed specifically for them (Johnson & Suskewicz, 2009). Innovative business models offer new ways to think about energy usage and the broader energy infrastructure (Kivimaa et al., 2017). They can have a devastating effect on incumbent firms.
The growth of the firms

Measuring growth
Generally, growth is conceptualized as a firm’s progression from an early stage of exploring ideas and formulating business plans via an intermediate stage of refining ideas and implementing business plans to a final stage of expanding operations and scaling a business (Dutt et al., 2016). A question within renewable energy studies is how to measure this progress. Scholars describe that environmental entrepreneurs are often highly motivated idealists driven by a desire to address environmental degradation (Hockerts & Wüstenhagen, 2010; York et al., 2016). However, scholars stress that sustainable development should not be restricted to just environmental protection but needs to include the social and economic dimensions as well (Hockerts & Wüstenhagen, 2010). Brandt & Svendsen (2016) stress that it is crucial to convince non-green consumers about the profitability of local environmental management rather than its potentially green components. Also, the study of Mulder (2008), stresses that the economic attractiveness of investing is a necessary condition, but not a necessary and sufficient condition. A potential comprehensive measurement method might be the triple bottom line model that extends the traditional financial bottom line of a company with two additional bottom lines also measuring the company’s social and environmental responsibility (Hockerts & Wüstenhagen, 2010; Houda & Triki, 2014).

Type of firm growth
Scholars describe the various roles of firm types within the broader energy transition. It is often stressed that the role of local entrepreneurship and start-ups is essential (Ahrens, 2017; Brandt & Svendsen, 2016; Hockerts & Wüstenhagen, 2010; Süsser et al., 2016). Initiatives of local entrepreneurship are acknowledged to be crucial in the energy transition because these initiate the physical reshaping and social transformation of communities (Süsser et al., 2016). The study of Brandt & Svendsen (2016) focuses on the impact of local entrepreneurship on the energy transition through the involvement of ordinary people. The scholars stress that it is crucial to involve these ordinary people with no specific environmental preferences in the energy transition (Brandt & Svendsen, 2016). However, while the actions of local entrepreneurs are important, their impact on the sustainable transformation of industries is limited. Consequently, the role of large firms is also concluded to be important because they have a wider impact on the market (Hockerts & Wüstenhagen, 2010).

Hockerts & Wüstenhagen (2010) distinguish two different type of firms; ‘Emerging Davids’ and ‘Greening Goliaths’. Their study highlights their advantages and challenges. Emerging Davids are active in high-end environmental or social niches and stimulate disruptive sustainable innovation. Whereas, Greening Goliaths routinely engage in incremental environmental or social process innovation (Hockerts & Wüstenhagen, 2010). Promising clean-tech offerings should operate within these niches instead of the demanding dominant regimes. In these niches the value proposition offered by new entrants may be so great that customers are willing to overlook their shortcomings (Johnson & Suskewicz, 2009). These niches are explained as protective spaces for innovations that are otherwise likely to be unsuccessful in dominant regimes (Smith & Raven, 2012). Hockerts & Wüstenhagen (2010) stresses that both Emerging Davids and Greening Goliaths have a role to play in the energy transition and propose a co-evolution of both firm types. It is stated that it is the compound
impact that will lead an industry towards sustainability. Where small firms and new entrants will stimulate disruptive sustainability innovation, incumbent companies will be attracted by the market success of these small firms and will take the industry transformation to the next level. The scholars propose an ambidextrous innovation policy, pursuing both incremental and radical innovations.

4.4. High-growth firms

Definitions

High-growth entrepreneurship has been increasingly drawn into policy focus, as governments have recognized that not all new firms contribute equally to the economy. This has contributed to an increased interest in policy initiatives specifically targeted at facilitating high-growth entrepreneurial activity (Autio & Rannikko, 2016). Terjesen, Bosma, & Stam (2016) describe high-growth entrepreneurship as the subset of entrepreneurs and firms that have realized a substantial increase in firm size (employees) or output (sales) over a number of years. This builds the understanding that the economical impact is considered important. The Organization for Economic Co-operation and Development (OECD) presents a more fundamental definition; “All enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the observation period. Growth is thus measured by the number of employees and by turnover” (Audretsch, 2012, p. 3). This definition is used consistently among several studies (Brown & Mason, 2014; Brown & Mawson, 2016; Brown, Mawson, & Mason, 2017). This definition of a high-growth firm provides a contrast to the more conventional concept of a gazelle firm, which normally defined as; “All enterprises up to five years old with average annualized growth greater than twenty percent per annum over a three-year period, and with ten or more employees at the beginning of the observation period” (Audretsch, 2012, p. 3). An interesting addition provided by Brown et al. (2017) stresses that high-growth is not a characteristic, but rather a state that firms temporarily experience. This emphasizes that high-growth firms are highly episodic in nature and thus the population of high-growth firms is constantly fluctuating. This insight helps understanding that high-growth firms are difficult to target for policy makers and researchers (Brown et al., 2017).

High-growth entrepreneurship has been relatively well studied in literature. We will focus more specifically on the role of these firms in the energy transition (Autio & Rannikko, 2016; Brown & Mawson, 2016; Brown et al., 2017; Cooper & Park, 2008; Terjesen et al., 2016). Additionally, scholars emphasize the crucial role of intermediaries in solving the entrepreneurial crisis (Davila, Foster, & Jia, 2010). Furthermore, the broader role of intermediary management in stimulating high-growth firms has received great attention (Autio & Rannikko, 2016; Buckley & Davis, 2016; Cooper & Park, 2008; Terjesen et al., 2016), including some critiques (Brown & Mason, 2014; Brown & Mawson, 2016; Brown et al., 2017; Terjesen et al., 2016).

Role in energy transition

These high-growth firms are predestined to play a crucial role in the transition towards renewable energy. However, no studies have been found that stress the important role of high-growth firms specifically in the energy transition. Still, the importance of high-growth firms on the growth of an economy is stressed by various scholars (Autio & Rannikko, 2016;
Brown & Mawson, 2016; Brown et al., 2017; Cooper & Park, 2008; Terjesen et al., 2016). These high-growth firms comprise a small proportion – around 15% – of the overall population of SMEs within most developed economies, policy makers vision these firms as the disruptive and dynamic share of the entrepreneurial ecosystem (Brown & Mason, 2014). This small group of high-growth firms is responsible for the majority of new economic activities and are key for innovative growth (Terjesen et al., 2016). High-growth firms experience a substantial increase in firm size (employees) or output (sales) over a number of years (Terjesen et al., 2016). This economic prosperity and sustainability is only reached when a young firm transcends the emergence stage and successfully reaches a long-term growth stage, and even more desirable, a stage of high-growth (Eisenhardt & Schoonhoven, 1990). Therefore, we presume that these firms play an important role in the transitions of large sociotechnical systems, e.g. the energy transition. The upside potential of high-growth firms creates broad support for intermediary policy directed at high-growth firms that produce and diffuse renewable technologies.

Entrepreneurial crisis
The study of Davila et al. (2010) specifically focuses on the role of management systems in relation to firm growth. The scholars stress that at some point in the process of growth, somewhere between 50 and 100 employees, the management style needs to change from a personal into a more professional management style. This specific growth stage is defined as the entrepreneurial crisis; “when the company reaches a certain scale and moves to a higher growth stage and the entrepreneur has to transition into becoming a manager” (Davila et al., 2010, p. 80). However, entrepreneurs often worry about bureaucracy within their organization. The resistance of the entrepreneur to switch to a more structured management approach and to adopt management systems often results in entrepreneurial failure. This can result in stagnated growth to keep the company under control. Thereby, not reaching a stage of high-growth. Moreover, having no systems (chaos) is as damaging to a company as having too many (bureaucracy). Entrepreneurial firms might even suffer more from chaos than from bureaucracy. Management systems do provide the infrastructure that is associated with the likelihood of a venture safely transitioning through the entrepreneurial crisis (Davila et al., 2010). It is possible that these entrepreneurial firms could grow more if special attention was paid to making entrepreneurs aware of the need to implement systems that support such growth (Davila et al., 2010). Hence, intermediaries can play an important role in overcoming the entrepreneurial crisis through support in this specific growth stage.

Role of intermediaries
In transitions of large sociotechnical systems, intermediary organizations can emerge as mediators in between several actor groups and facilitate collaboration towards common goals (Backhaus, 2010). Intermediaries are organizations that aim to increase both the survival and growth rate of new and existing firms. Because a small group of high-growth firms provide the majority of new economic activities, policy makers are motivated to focus on high-growth firms rather than the creation of new firms and self-employment in general (Terjesen et al., 2016). The development of an economic and policy environment supporting new, high-growth firms has become common strategy adopted by many policy makers (Cooper & Park, 2008). Thereby, aiming to promote future economic growth and job creation. To stimulate high-growth firms, governments use different policy mechanisms aiming at finance, labour market regulations, investment in new knowledge and opening up
new markets (Terjesen et al., 2016). Autio & Rannikko (2016) underpin that it is very difficult to implement high-growth policies successful because ‘picking winners’ is hard and governments and intermediaries are often poorly equipped to do so (Autio & Rannikko, 2016). However, because of the large upside potential of high-growth firms, high-growth policies are often justified (Autio & Rannikko, 2016). A way to counter the picking winners problem is by introducing a selection logic that emphasizes retention over selection. Here, relatively loose selection criteria would be used in initial selection, and support would grow more substantial as the firm meets growth milestones (Autio & Rannikko, 2016). However, different scholars propose more inclusive entrepreneurship policies directed at a broader entrepreneurial climate (Terjesen et al., 2016).

Buckley & Davis (2016) emphasize the difficulty of measuring the impact of business intermediaries because of hard (objective) and soft (subjective) criteria. Hard criteria refer to outcomes as costs reductions, increase in turnover and profitability. Soft criteria refer to outcomes as the ability to manage, network improvements and the increase in knowledge and skills. The scholars propose that business intermediaries must demonstrate their success in both hard and soft measures as agreed with key stakeholders (Buckley & Davis, 2016). Cooper & Park (2008) stress that intermediary management for high-tech firms extra important. High-tech firms involve a definite element of risk and need to make calculated assessments. Therefore, it is crucial that high-tech firms have access to the necessary technical and commercial knowledge to evaluate these risks. Intermediary organizations can be of extra importance for it these stages of risk assessment because of their specific knowledge and network (Cooper & Park, 2008).

**Critiques**

Among the attention that high-growth firms have received from scholars there have also been some serious critiques. Different scholars emphasize the fundamental misconceptions that are present in the literature concerning high-growth firms (Brown & Mason, 2014; Brown & Mawson, 2016; Brown et al., 2017; Terjesen et al., 2016). These misconceptions are described as myths by Brown et al., (2017). They stress that policy makers have selectively utilized and/or misinterpreted the evolving high-growth literature, resulting in myths and misconceptions about these firms becoming deeply embedded within policy frameworks (Brown et al., 2017). These myths are strongly influencing the targeting of high-growth policy. There are two different explanations given for the developments of these myths. First, the policy entrepreneurs base policies on past experience and thereby stick to their tried and tested mental models. Through these decisions, certain beliefs become embedded within public policy without any explicit acknowledgement or reasoning. Second, the empirical evidence might be selectively used leading to an over-emphasis on the ‘Silicon Valley model of entrepreneurship’ (Brown et al., 2017). This over-emphasis lead to belief that high-growth firms predominantly emerge from the stock of high-tech firms within an economy is criticized by different scholars (Brown & Mason, 2014; Brown & Mawson, 2016; Brown et al., 2017; Terjesen et al., 2016). Brown & Mason (2014) specifically focus their research on the nexus of high-tech firms and policies. For many policy makers these high-tech firms have become something of a ‘stylized fact’ and are panacea for boosting growth within modern economies (Brown & Mason, 2014).

Brown & Mawson (2016) criticize the linear approach to innovation that is deeply embedded within incubator and accelerator policies designed to support high-growth firms. The
assumption that firm growth is an orderly, incremental process is fundamentally wrong. Rather, firm growth seems to be highly volatile with periods of slow incremental growth often interjected with ‘jumps’ of rapid growth and expansion (O’Farrell & Hitchens, 1988). This relates to the definition provided by Brown et al. (2017) stating that high growth is not a characteristic, but rather a state that firms temporarily experience. This helps understanding that supporting potential high-growth firms is a highly difficult activity for policy makers to undertake (Brown & Mawson, 2016).

Another interesting critique concerns the focus of policy research. Most of these studies focus on the generation, rather than the diffusion, of innovations. Accordingly, policy makers often promote ‘knowledge generation’ policies instead of ‘knowledge exploitation’ interventions. This reflects in the strong support given to new technology based firms instead of systemic policies to address the diffusion of innovation across the economy as a whole (Brown & Mason, 2014).
5. Conclusion and research gap

Overall, after reviewing the literature on the nexus of energy transition, high-growth firms and intermediaries it has become evident that these research themes have not been combined in current academic literature. Thereby indicating an underdeveloped field of research and a possible research gap. To better understand the context of the research we broadened our search combining four different research themes; Energy transition & Entrepreneurship; Energy transition & Intermediaries; High-growth firms & Intermediaries.

Climate change has become one of the greatest global challenges and it is largely identified as the most important environmental problem facing our globe (Houda & Triki, 2014). To engage this challenge, many countries are pursuing the research, development, and demonstration of renewable energy sources (Shen et al., 2011). An energy transition from a fossil-based market to a more renewable energy market demands a major infrastructural shift. This does not only involve technologies to be replaced by better technologies, rather, complete systems to be replace by new systems. Entrepreneurs have a prime role in helping our society transition towards a sustainable environment. Their actions determine whether or not renewable energy technologies are successfully developed and implemented (Meijer et al., 2010) and they are essential for a well-functioning innovation system (Brown & Mason, 2014). Environmental entrepreneurs are often highly motivated idealists driven by a desire to address environmental degradation (Hockerts & Wüstenhagen, 2010; York et al., 2016). However, sustainable development should not be restricted to just environmental protection but needs to include the social and economic dimensions as well (Hockerts & Wüstenhagen, 2010). The triple bottom line model extends the traditional financial bottom line of a company with two additional bottom lines also measuring the company’s social and environmental responsibility (Hockerts & Wüstenhagen, 2010; Houda & Triki, 2014).

High-growth entrepreneurship has been increasingly drawn into policy focus, as governments have recognized that not all new firms contribute equally to the economy. This has contributed to an increased interest in policy initiatives specifically targeted at facilitating high-growth entrepreneurial activity (Autio & Rannikko, 2016). High-growth firms are defined as; “all enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the observation period. Growth is thus measured by the number of employees and by turnover” (Audretsch, 2012, p. 3). However, Brown & Mawson (2016) stress that growth is not a linear, orderly and incremental process. Rather, firm growth seems to be highly volatile with periods of slow incremental growth often interjected with ‘jumps’ of rapid growth and expansion (O’Farrell & Hitchens, 1988). Brown et al. (2017) stress that high growth is not a characteristic, but rather a state that firms temporarily experience. This helps understanding that supporting potential high-growth firms is a highly difficult activity for policy makers to undertake (Brown & Mawson, 2016).

The renewable energy market is an emerging industry and still largely dependent on public policy stimulating technology demand, such as feed-in-tariffs or quota obligations (Ahrens, 2017; Bjornali & Ellingsen, 2014; Doblinger et al., 2016). These policies might acts as
Effective drivers of long-term innovation and success in the renewable energy industry (Marra et al., 2016). Policy makers therefore are highly motivated to accelerate the developments and commercialization of new renewable energy solutions (Erikson et al., 2015). Critics claim that electricity production is too highly dependent on subsidies such as feed-in tariffs. However, leading scholars stress that the plunging costs of technology will sweep away political inertia and the resistance of vested interest (Parkinson, 2015). As soon as the major technology breakthrough has been achieved, the global energy transition will be unstoppable (Ahrens, 2017).

In transitions of large sociotechnical systems, intermediary organizations can emerge as mediators in between several actor groups and facilitate collaboration towards common goals (Backhaus, 2010). Intermediaries are defined as actors that create spaces and opportunities for others and mediate, make connections and enable relationships between different parties (Martiskainen & Kivimaa, 2017), thereby facilitating knowledge and technology transfer between different firms. Sperling (2017) stresses another important role of intermediaries, being the alignment of the external and internal context. These intermediaries could potentially perform crucial activities that support the acceptance of system innovations (Martiskainen & Kivimaa, 2017).

As mentioned, high-growth firms are predestined to play a crucial role in the transition towards renewable energy. However, no studies have been found that stress the important role of high-growth firms specifically in the energy transition. Despite their large upside potential, policies for intermediary management of high-growth firms are inconsistent and receive a lot of criticism. Here, we identify a relevant research gap. Better understanding of the organization of intermediaries, that aim to stimulate high-growth firms in the renewable energy market, might help to accelerate the energy transition by enabling more effective (policy) support of these high-growth firms. Balachandra et al. (2010) state that despite some environmental technologies are (becoming) profitable there has not been an overwhelming inflow of human and financial capital into the renewable energy sector. Thereby, the energy revolution is still waiting to happen. This highlights the importance of our research.

This literature review has provided insights into the individual characteristics of the three research themes, - energy transition, high-growth firms and intermediaries - and the relations between them. Additionally, this review has contributed to the defining of a challenging but feasible research question for the master thesis project:

*How are intermediaries in the Dutch renewable energy market organized to stimulate high-growth firms?*

Academic research has an important role to play in contributing to a stronger evidence base in order to properly design, execute and evaluate entrepreneurial policies for high-growth firms. Our master thesis project aims to do so by studying the organization of intermediary organizations in the Netherlands.
6. References


Parkinson, G. (2015). Paris COP21: Climate talks may not matter, because coal and oil will be


Appendix B: Interview protocol in English and Dutch

English

Place and date:

Interviewee:

Intermediary:

Introduction
I am Joep Sinke, a master student Innovation Management at the Eindhoven University of Technology. As part of my master thesis, I am conducting a research on the role of high-growth firms and intermediary management within the energy transition.

Aim of the research
This interview protocol aims to better understand intermediary management within the energy sector, more specifically their support on high-growth firms. The protocol is semi-structured as this best matches the explorative and qualitative nature of the research. Semi-structured interviews remain open-ended and are conducted in a conversational manner, while following a protocol (Yin, 2006). The interview aims to last about one hour and will be recorded if the interviewee gives permission.

It is targeted at individuals that are involved in intermediary management of (high-growth) energy firms. The protocol considers questions related to aspects affecting the definition of the intermediary, their considered levels of support and their role in the energy transition. These questions are derived from CIMO-logic design principles. These principles are the result of our systematic literature review.

A selection of intermediaries is made based on an evaluation of our self-composed database. To select them, a basic profile is developed:

• Participant must be involved in an intermediary focused on the Dutch energy market
• Participant should be expert on one or more topics contained in the interview protocol
• Participant must be available for interview conduction
• Participant should be able to give answers to the questions
Questions and probes

1. **Can you give a short introduction about yourself and about your activities and responsibilities within the innovation intermediary organization that you work for?**
   - What is your previous education and work experience?
   - What type of intermediary do you work for?
   - In which industries lies the main focus of the intermediary? (Energy?)
   - What is your position within this intermediary?

2. **What is innovation intermediary management for you?**
   - What kind of support do you link to intermediary management?
     - Office space, coaching, funding, network, intellectual property, legal, etc.
   - What kind of organizations is the support aimed towards?
   - Can you name different intermediary types?
   - How do you distinguish their differences?
   - Example: What is the difference between an incubator and an accelerator?

3. **How would you describe the energy transition? What do you consider to be the role of entrepreneurship within the energy transition?**
   - What are the roles of start-ups and incumbent firms within the energy transition?

4. **What is the role of intermediary management in the energy transition?**
   - Are intermediaries actively involved in the energy transition?

5. **Are you aware of the term ‘high-growth firm’? What characteristics do you associate with a high-growth firm?**

6. **What do you consider to be the role of high-growth firms in the energy transition?**

7. **What is the role of intermediary management considering the support of high-growth firms?**

8. **What support mechanisms are needed to stimulate high-growth firms?**
   - Office space, coaching, funding, network, intellectual property, legal, etc.

9. **What is the government’s role in the energy transition and how dependent are intermediaries on their policies?**

10. **What do you associate with a broad system perspective towards policy management?**
    - Inclusive entrepreneurship policies, emphasize retention over selection, stimulate knowledge exploitation, policy generosity, policy continuity, open innovation perspective, ambidextrous (government) policies, etc.
11. How do you value generosity and continuity of policies? And how receptive are startup firms vs. incumbent firms for the generosity and continuity of policies?
   - Policy generosity: the attractiveness of the policy support system.
   - Policy discontinuity: the inability to predict the future state of the regulatory environment

12. Can you explain the different stages of startup financing?
   - (Pre-) seed investments, Series A, Series B, etc.?
   - Where would you place high-growth firms in this spectrum?
   - What kind of capital providers are involved in the different stages?
   - What kind of funding does the intermediary that you are involved in provide?

13. What is important when facilitating a firm with access to finance?
   - How is this related to the different start-up and financing stages and does this differ among the different stages?
   - Is there a need of additional guidance related with funding? What kind of guidance?
     o Mentoring, providing network, enabling customer or end-user connection, commercialization assistance, assistance in sales & marketing, business model development, become more outward oriented/market driven, etc.

14. What is the role of a changing business model for the high-growth firms in order to stimulate the energy transition?
   - Dynamic capabilities, open innovation perspective, applying external knowledge, stimulate new entry, fee-paying services for early sales, etc.

15. What do you know about the uncertainties that a firm experiences in the transition from a personal towards a more structured management approach?
   - What is needed to overcome the crisis?
   - How can policies help to overcome the entrepreneurial crisis / the uncertainties that are experienced in this period?
     o Management infrastructures, management systems, hire specific knowledge, involvement of professional investors, government support, etc.

16. Do you have any further comments or recommendations?
   - Recommendations regarding interview questions
   - Recommendations regarding aspects of intermediary management
   - Recommendations regarding interesting contacts that would be open for an interview

17. What are your thoughts on the presented overview of startup development stages and financial stages?
   - Which intermediaries and capital providers are involved?
   - What is the difference of energy firms in relation to other firms?
   - Can you make a categorization on renewable energy firms (investments & revenue stream)

I intend to have one interview per person. However, if I have any follow up questions I will contact you via phone or e-mail.

Thank you for this interview!
**Dutch**

Plaats en tijd:

Respondent:

Intermediair:

**Introductie**

Mijn naam is Joep Sinke, en momenteel ben ik bezig met het afronden van mijn master opleiding Innovation Management aan de Technische Universiteit Eindhoven (TU/e). Hierbij richt ik mij op de rol van ondernemerschap binnen de energie transitie en de invloed van intermediaire (tussenpersonen) in dit proces.

**Doel van dit onderzoek**

Met dit onderzoek wordt beoogd om een beter begrip te krijgen van de rol van innovation intermediaries (tussenpersonen) binnen de energie transitie. En specifieker, naar de rol van high-growth firms. Het interview protocol heeft een semigestructureerde samenstelling passend bij de exploratieve en kwalitatieve aard van het onderzoek. Semigestructureerde interviews hebben een open benadering en worden afgenomen op een conversationele wijze, ondertussen wel vasthoudend aan een protocol (Yin, 2006). Het interview duurt ongeveer een uur en zal worden opgenomen wanneer hier toestemming voor wordt gegeven.

De interviews worden afgenomen bij personen die direct betrokken zijn bij een intermediaire organisatie, en die bij voorkeur support bieden aan high-growth firms. Het protocol behandeld vragen aangaande definities en categorisatie van intermediaire, de levels van support en de rol van de intermediaire binnen de energy transitie. De vragen zijn afgeleid van CIMO-logic design principles welke zijn opgesteld na het doen van een systematische literatuurstudie.

Een selectie van intermediaire is gemaakt op basis van een zelf samengestelde database. Een verdere selectie is gemaakt op basis van de volgende criteria:

- Respondent moet betrokken zijn bij een intermediaire organisatie gericht op de Nederlandse energie markt
- Respondent is een expert aangaande ten minste een van de onderwerpen behandeld in het interview
- Respondent moet beschikbaar zijn voor een interview
- Respondent moet in staat zijn interview vragen te beantwoorden
Vragen

1. Kunt u een korte introductie geven over uzelf en over uw activiteiten en verantwoordelijkheden binnen de (innovatie) intermediaire organisatie waarbij u betrokken bent?
   - Wat is uw vooropleiding en werkvordering?
   - Bij wat voor een type intermediaire bent u betrokken en wat zijn uw verantwoordelijkheden?
   - In welke industrie ligt de hoofdfocus van de intermediair? (Energie?)
   - Wat is uw positie binnen de intermediair?

2. Wat is (innovatie) intermediair management voor u?
   - Wat voor een support linkt u aan intermediaire management?
     - Bedrijfstruimte, coaching, financiering, netwerk, IP, legal, etc.
   - Aan wat voor organisaties is de support gericht?
   - Kunt u verschillende type intermediaire benoemen?
   - Hoe zou u de verschillen tussen deze intermediaire beschrijven?
   - VB: wat is het verschil tussen een incubator & accelerator?

3. Wat is uw beschrijving van de energie transitie? En hoe ziet u de rol van ondernemerschap binnen de energie transitie?
   - Wat is de rol van start-ups binnen de energie transitie?
   - Wat is de rol van gevestigde bedrijven binnen de energie transitie?

4. Wat is de rol van intermediair management binnen de energie transitie?
   - Vervullen zijn een actieve rol binnen de transitie?

5. Bent u bekend met de term ‘high-growth firm’? Welke karakteristieken associeert u met een high-growth firm?

6. Wat ziet u als de rol van high-growth firms binnen de energie transitie?

7. Wat is de rol van intermediair management betreft de support van high-growth firms?

8. Wat voor support mechanismen zijn er volgens u nodig om high-growth firms te stimuleren?
   - Bedrijfstruimte, coaching, financiering, netwerk, IP, legal, etc

9. Wat ziet u als de rol van de overheid in de energie transitie en hoe afhankelijk zijn intermediaire organisaties van overheidsbeleid?

10. Wat associeert u met een breed (systeem) perspectief, ‘system perspective’, als het gaat om support management?
    - Inclusief ondernemerschapsbeleid, nadruk op behoud i.p.v. selectie, stimulering van kennis exploratie, genereus beleid, beleidscontinuïteit, open innovatieperspectief, dubbelhartig (ambidextrous policies), etc.

11. Wat is volgens u het belang van genereus beleid en de continuïteit van het beleid? En hoe ontvankelijk zijn start-ups hiervoor in vergelijking met gevestigde bedrijven?
- Policy generosity: the attractiveness of the policy support system.
- Policy discontinuity: the inability to predict the future state of the regulatory environment

12. Kunt u de verschillende start-up faseringen benoemen (financial stages)?
   - (Pre-) seed investments, Series A, Series B, etc.?
   - Waar zou u high-growth firms plaatsen binnen dit spectrum?
   - Welke kapitaalverschaffers zijn betrokken bij de verschillende fasen?
   - Wat voor financiering wordt er verschaft door de intermediaire waarbij u betrokken bent?

13. Wat is er belangrijk bij het faciliteren van een onderneming wanneer deze toegang heeft gekregen tot financiering?
   - Hoe is dit gerelateerd aan de fase waarin de onderneming zich bevindt en wat is hierin het verschil tussen de start-up fasen?
   - Is er behoefte aan extra begeleiding wanneer financiering rondkomt? Wat voor:
     o Mentoring, netwerk, connectie met klant of eindgebruiker, ondersteuning in de commercialisering, sales & marketing, ontwikkeling van business modellen, meer naar buiten gericht / marktgestuurd, etc.

14. Wat is de rol van een (veranderend) business model voor high-growth firms om succesvol te kunnen zijn binnen de huidige energie market?
   - Dynamische mogelijkheden, open innovatie benadering, toepassen van externe kennis, stimulering van nieuwe markten, betalende klanten voor early-sales, etc.

15. Wat weet u van de onzekerheden welke worden ervaren bij de overgang van een persoonlijke management stijl naar een meer gestructureerde management stijl?
   - Wat is er nodig om deze crisis te voorkomen?
   - Hoe kan beleid helpen bij het overkomen van de onzekerheden in deze periode?
     o Management infrastructuur, management systemen, binnenhalen / aannemen van specifieke kennis, betrokkenheid van professionele investeerders, overheid support, etc.

16. Wat vindt u van het gepresenteerde overzicht van start-up ontwikkelingsfasen en financiële fasen?
   - Welk type intermediaire en verschaffers van kapitaal zijn er betrokken?
   - Wat is het verschil met energie bedrijven ten opzichte van andere ondernemingen?
   - Is er een categorisatie te maken tussen energie bedrijven (investments & revenue stream)

17. Heeft u verdere op- of aanmerkingen op dit interview?
   - Aanbevelingen betreft interview vragen
   - Aanbevelingen omtrent de rol van intermediair management
   - Interessante contacten die ik zou moeten spreken in mijn onderzoek

Mijn doel is om de interviews te beperken tot één per persoon, mocht ik aanvullende vragen hebben dan neem ik telefonisch of per mail contact met u op.

Enorm bedankt voor dit interview!
## Appendix C: Coding Scheme

<table>
<thead>
<tr>
<th>Question Nr.</th>
<th>Label Nr.</th>
<th>Labels used for codebook</th>
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### Design Principles (DP) vs. Interview Questions (IQ) - Labels

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<th>Interview Questions (IQ)</th>
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<td>Physical reorganizing and social transformation of communities</td>
<td>Involvement of ordinary people</td>
<td>3. What is the role of leadership within the energy transition?</td>
<td>3.2 Support of innovation intermediaries of high-growth firms</td>
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<td>2</td>
<td>Tax credits</td>
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<td>Target innovations and early adopters</td>
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<td>3.2 Support of innovation intermediaries of high-growth firms</td>
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<td>Stimulate manifesting clean-tech offerings to operate niche-markets</td>
<td>Strong extra industry tax</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>Innovation strategies</td>
<td>Support early-stage R&amp;D</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
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<td>6</td>
<td>Specific intermediary support for high-growth firms</td>
<td>Access to technical and contextual knowledge</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>7</td>
<td>The heterogeneity of high-growth firms should be reflected in supporting policies</td>
<td>Look behind the facts</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>8</td>
<td>Non-routine programmes concerning needs of local entrepreneurial or institutional context</td>
<td>Care-by-case qualitative assessment</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>9</td>
<td>Apply open innovation strategy taking into account possible emerging &amp; acquisitions</td>
<td>Assistance with ownership change</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>Orientation towards continuous support (instead of one-time demonstration)</td>
<td>Ensures continuous support to developing products and technologies</td>
<td>7. What is the role of intermediary management considering the support of high-growth firms?</td>
<td>7. Support of innovation intermediaries of high-growth firms</td>
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<td>Key enabling factors in the transition</td>
<td>Early-stage funding</td>
<td>10. What do you associate with a broad system perspective towards the energy transition?</td>
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<td>Design push policies to promote technology on the demand side</td>
<td>Relatively loose selection criteria</td>
<td>10. What do you associate with a broad system perspective towards the energy transition?</td>
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<td>Acceleration of the diffusion of complex renewable energy technologies</td>
<td>System-level context to developing products and technologies</td>
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<td>Broad perspective towards policy management</td>
<td>9.1 Government role in the energy transition</td>
<td>9.1 Government role in the energy transition</td>
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<td>Facilitate the construction of effective business models</td>
<td>Include traditional skills with less formal innovation processes</td>
<td>9.1 Government role in the energy transition</td>
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<td>Switch from a personal towards a more structured management approach during the entrepreneurial crisis</td>
<td>Implement management systems</td>
<td>15.2 Overcoming the entrepreneurial crisis</td>
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Appendix E: Matrix of labels - interviewees

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<th>Matrix overview labels/intermediaries</th>
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<td>2.1.1 Definition of their own organization</td>
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<td>9.2 Dependency of innovation intermediaries on government policies</td>
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<td>9.3 Critics on the role of government in energy transition</td>
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<td>10 Broad system perspective</td>
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<td>11.2 Policy continuity</td>
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<td>12.1 Familiarity with start-up stages</td>
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<tr>
<td>12.1.1 High-growth firms position in the entrepreneurial process</td>
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<td>12.2 Providers of capital important for high-growth firms</td>
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<td>13 Support of high-growth firms when access to capital</td>
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<tr>
<td>14 Changing business model for high-growth firms</td>
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<td>15.1 Uncertainties in the entrepreneurial crisis</td>
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<tr>
<td>15.2 Overcoming the entrepreneurial crisis</td>
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<td>16.1 Difference of entrepreneurship in the energy transition</td>
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<tr>
<td>16.1.1 Lack of sales and marketing capabilities</td>
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<tr>
<td>16.2 Categorization of energy firms</td>
<td></td>
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<tr>
<td>16.3 Difference between NL and other countries</td>
<td></td>
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</table>

List of Abbreviations

<table>
<thead>
<tr>
<th>University Incubator</th>
<th>U.I.</th>
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<tr>
<td>Public Accelerator</td>
<td>Pu.A</td>
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<tr>
<td>Private Accelerator</td>
<td>Pr.A</td>
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<tr>
<td>Sales Accelerator</td>
<td>S.A.</td>
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<td>Regional Cooperation</td>
<td>R.C.</td>
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<td>Crowdfunding Platform</td>
<td>C.P.</td>
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<tr>
<td>Business Angels Network</td>
<td>B.A.N.</td>
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<tr>
<td>Regional Investment Fund</td>
<td>R.I.F.</td>
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<tr>
<td>Corporate investor A</td>
<td>C.I.A</td>
</tr>
<tr>
<td>Corporate investor B</td>
<td>C.I.B.</td>
</tr>
<tr>
<td>Venture Capitalist</td>
<td>VC</td>
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</table>

Label has been discussed with the interviewee

Label has not been discussed with the interviewee
### Appendix F: Broader description of intermediary goal and their contribution

<table>
<thead>
<tr>
<th>Intermediary type</th>
<th>Goal</th>
<th>Contribution to entrepreneurs / high-growth firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Incubator</td>
<td>• Support the entrepreneurial spirit</td>
<td>• Provide education on entrepreneurship</td>
</tr>
<tr>
<td></td>
<td>• Facilitate student entrepreneurship</td>
<td>• Improve the entrepreneurial ecosystem</td>
</tr>
<tr>
<td></td>
<td>• Integrate practice-based challenges in academic education</td>
<td>• Connecting practice and academics</td>
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<tr>
<td></td>
<td></td>
<td>• Providing network and coaching</td>
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<tr>
<td></td>
<td></td>
<td>• Providing prototyping facilities</td>
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<tr>
<td>Representative quote:</td>
<td></td>
<td>“I see it as an intermediary in the very early phase of entrepreneurship. It depends on the framework you use.</td>
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<tr>
<td></td>
<td></td>
<td>You can even see it as pre-entrepreneurial because, where does entrepreneurship start right? You have an idea</td>
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<tr>
<td></td>
<td></td>
<td>and you form a team, so then it is already entrepreneurship but if you think it starts at the moment you start a</td>
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<tr>
<td></td>
<td></td>
<td>company officially, then this would be pre-entrepreneurial.”</td>
</tr>
<tr>
<td>Public accelerator</td>
<td>• Selecting the best initiatives into their program</td>
<td>• Provide mentoring and coaching</td>
</tr>
<tr>
<td></td>
<td>• Create valuable initiatives focused on the renewable energy market</td>
<td>• Provide network and community</td>
</tr>
<tr>
<td></td>
<td>• Help to scale the businesses</td>
<td>• Providing equity free capital</td>
</tr>
<tr>
<td>Representative quote:</td>
<td></td>
<td>“In any case, it must be climate-related” – Public accelerator program</td>
</tr>
<tr>
<td>Business Angels Network</td>
<td>• Create value together with the entrepreneur</td>
<td>• Support entrepreneurs with private investments</td>
</tr>
<tr>
<td></td>
<td>• Taking an equity share in valuable businesses</td>
<td>• Knowledge and network</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Take on a coaching role</td>
</tr>
<tr>
<td>Representative quote:</td>
<td></td>
<td>“There must already be an intrinsic value. So a good idea is not enough, no matter how good the idea is. There</td>
</tr>
<tr>
<td></td>
<td></td>
<td>must already be a patent or a proof-of-concept, there must already be something of value, a potential. That is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>always the starting point.”</td>
</tr>
<tr>
<td>Private accelerator</td>
<td>• Selecting the best initiatives into their program</td>
<td>• Provide mentoring and coaching</td>
</tr>
<tr>
<td></td>
<td>• Taking an equity share in valuable businesses</td>
<td>• Provide network and community</td>
</tr>
<tr>
<td></td>
<td>• Help to scale the businesses</td>
<td>• Access to investors</td>
</tr>
<tr>
<td>Representative quote:</td>
<td></td>
<td>“What we in general offer to the start-ups is that we are an access point to capital, expertise and in general</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to our network. So we open doors, we have an ecosystem and a network and through us they can access that.”</td>
</tr>
<tr>
<td>Regional cooperation</td>
<td>• Connect internationally operating companies, knowledge institutes</td>
<td>• Matchmaking between different organizations</td>
</tr>
<tr>
<td></td>
<td>and local governments</td>
<td>• Connecting market and demands</td>
</tr>
<tr>
<td></td>
<td>• Connect promising scale-ups with corporates</td>
<td>• Facilitate project initiations</td>
</tr>
<tr>
<td></td>
<td>• Bring cleantech innovations to the market faster</td>
<td>• Create access to financing</td>
</tr>
<tr>
<td>Representative quote:</td>
<td></td>
<td>“We are not on the provider or capital side, because we do not actually do that. If capital is needed, we give an</td>
</tr>
<tr>
<td></td>
<td></td>
<td>introduction or we refer people to a specific subsidy or to a fund.”</td>
</tr>
<tr>
<td>Crowdfunding platform</td>
<td>• Facilitate growth of sustainable and social entrepreneurship</td>
<td>• Provide a platform to raise investments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Execute analysis on the initiatives</td>
</tr>
<tr>
<td>Representative quote:</td>
<td></td>
<td>“The starting point we have is that we want to help entrepreneurs to make a next growth step. Or project</td>
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<tr>
<td></td>
<td></td>
<td>financing, for sustainable energy projects, to help them to be registered. Together with a crowd of financial</td>
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<tr>
<td></td>
<td></td>
<td>investors who want to make a positive impact with their money in addition to the financial return. That is what</td>
</tr>
<tr>
<td></td>
<td></td>
<td>we do.”</td>
</tr>
</tbody>
</table>
| Regional Investment Fund | • Facilitate rapid growth of renewable energy firms  
  • Taking an equity share in valuable businesses | • Providing capital  
  • Providing strategic support |

**Representative quote:**

“Regional development companies may be und underestimated, but they deal very professionally with the material so you can actually consider us as a sort of venture capitalist alongside all the other venture capitalists in the market. But relatively we are a little more early stage.”

| Corporate investor A | • Being involved with new entrepreneurial initiatives with real growth potential  
  • Spin-in innovative knowledge and technologies | • Support entrepreneurs with investments  
  • Facilitate entrepreneurs with knowledge, coaching and network  
  • Launching customer connection  
  • Improve the entrepreneurial ecosystem |

**Representative quote:**

“If I just look at our organization, when we want to get involved, these are already mature organizations that want to expand to internationally. They have been able to file annual accounts for a number of years, where you can base the return on your investment on. On the other hand, you also want to adopt some smaller, somewhat premature, companies. When successful, you can also get the most conversion on returns, of course, that is what every investor wants. For an organization like ours it requires a lot of coordination internally. So that asks a lot of our organization. We therefore work less with start-ups, but more with scale-ups.”

| Corporate investor B | • Being involved with new entrepreneurial initiatives with real growth potential  
  • Explore and exploit future market opportunities for mother company | • Facilitate entrepreneurs with knowledge, coaching and network |

**Representative quote:**

“The mother company is regulated, only on electricity and gas. Our organization may do the rest, because it operates outside the regulated domain. So we are there to explore what the world will look like. We also innovate but we innovate especially for our mother company.”

| Sales accelerator | • Invest in commercial initiatives that operate on an international market  
  • Realize rapid growth with firms that survived the start-up stage  
  • Reach large-scale application of cleantech in the market | • Providing a network  
  • Provide strategic support  
  • Connect scale-up companies with venture capital |

**Representative quote:**

“We became a sales accelerator, so not a typical accelerator where you facilitate companies in space, funding and that sort of things. We invest in a commercial device for international companies.”

| Venture Capitalist | • Facilitate rapid growth of smart energy companies  
  • Taking an equity share in valuable businesses | • Providing capital  
  • Providing strategic support |

**Representative quote:**

“Because you do both the transactions and the scouting of the interesting technologies and the companies and then help to really scale up those companies. So in all possible ways, use your network and your strategic thinking experience to help such a company grow.”
Appendix G: Entrepreneurial Journey
Appendix H: Intermediary Database

The following link provides access to the document online:

https://drive.google.com/open?id=1b0QSQ3GgrLfyxbSOSZSWufk8JR1Ew77