Overcoming the capital barrier for energy efficiency

An explorative study on energy efficiency in the industry to unlock its potential

MASTER THESIS

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Executive summary

On a global level, the goal is to limit global warming to well below 2°C to avoid irreversible alterations due to climate change. On European level, 20-20-20 targets are introduced which translate into a 20% reduction in greenhouse gas emissions, 20% increase in energy efficiency and 20% of energy derived from renewable sources. On the national level, The Netherlands has set a national goal of 14% share of renewables by 2020 and 16% by 2023. Currently, the share of renewables is 5.6%. To reach the goals set by the government and to move towards a sustainable society, effective measures are essential. One of the approaches is to improve energy efficiency.

The Dutch industry is responsible for approximately one third of the total national energy consumption. It is a major consumer and as it is the largest of all sectors, measures in this category are expected to have the most impact. The focus of this research is therefore on energy efficiency in the industry as it is believed that advances made in this sector can have a positive effect on a short term which will help in achieving nationally set sustainability goals. According to the cost abatement curve presented by McKinsey and Company, it is economically more cost-effective to focus on energy efficiency (in the industry) than on renewable energy technologies or Carbon Capture and Storage (CCS) technologies. Energy efficiency in the industry is disregarded while this sector is the largest energy consumer. This observation underlines the importance of this research.

Opportunities with potential for a sustainable future are being undervalued and there is a missing link between industry and capital. This mismatch can be regarded as a window of opportunity where capital can be linked to funding energy saving projects which can unlock the potential energy efficiency in the industry. This is not only beneficial for industrial companies and investors, but will also result in multiple benefits for society. This study is exploratory and is dedicated to identifying the barriers withholding the potential of energy efficiency in the industry with a focus on the capital barrier of energy efficiency. Possible (financial) mechanisms are researched and proposed so that more projects, aimed at energy efficiency, will be implemented. The main research question is therefore:

Which financial facilities should be implemented before 2023 to eliminate the capital barrier of energy efficiency and by doing so, improving energy efficiency in the industry and unlocking its potential?

In this study, three parts can be identified. Semi-structured interviews are conducted with technology suppliers and end-users, followed by a survey consisting of financial instruments. Five technology suppliers were interviewed, the focus was on sharing experiences and exploring (new) solutions. Three solutions were mentioned which are currently implemented by the technology suppliers. These are the rent-buy construction, an operational/financial lease and an ESCo construction. The experiences shared by the technology suppliers were used as input for the interview with the end-users and provided a good basis of knowledge.

For the interviews with the end-users, it is decided to only interview companies that take part in the long-term agreements between industry and government (MJA3/MEE). As they are responsible for 80% of the total industrial energy consumption and a quarter of the national

consumption, measures introduced in this group can have impact on the national energy consumption on a short term (within 5 years). Sixteen end-users agreed to take part in this study, of which ten MEE companies and six MJA3 companies. The companies are active in five different sectors; food, metallurgical, chemical, construction and paper. Furthermore are the interviewees of different positions, from an energy manager to the CEO of a company.

The interview with the end-users is divided into two parts; the semi-structured interview and a survey where elements of financial instruments are presented. The interview questions focuses on understanding the position of energy efficiency on a company level, the internal investment categorization of project, the barriers of implementation and the presentation of projects with a payback period of two to five years which are currently put aside. There is a multitude of projects, with potential, that are not implemented for several reasons. The reasons being: payback period exceeds the internal hurdle rate (>3yrs), lack of budget, no enforcement and no sense of urgency. Furthermore is it recognized that companies, which are closer to the consumer in the supply chain, value sustainability and energy efficiency more than companies situated earlier in the supply chain. These companies accept longer payback periods or have introduced sustainability criteria's, it is anticipated that this is caused by social pressure and green branding.

An interesting element of the interview was the discussion on the role of the government and the industries' perception on how the government is fulfilling its tasks. There was a consensus amongst the interviewed companies that there is no enforcement, especially on the Dutch Environmental Protection Act (Wet Milieubeheer) that states that all projects with a payback period of up to five years have to be implemented. It was furthermore mentioned that the government, as a whole, is not appreciated as a decent partner due to a lack of knowledge and expertise. This is different in Belgium or Germany, where the government is perceived as an appropriate partner. Fortunately, a positive sound was shared during the interviews where it was indicated that the government, especially on policy level, is waking up and is starting to realise that the industry can help in reaching national goals.

A crucial part of the research is the ranking of several financial elements of a financial instrument to determine which elements prevail when making an investment decision. It can be concluded that companies have a preference for using internal capital, if the internal budget allows it, and off-balance arrangements. Establishing and maintaining off-balance arrangements is however challenging and depends on the ownership of the equipment and division of risk. It is furthermore expected that this will be more difficult in the near future due to changing accounting standards from January 2019 onwards. The following elements are recognized as being critical: on-/off-balance, guarantees, duration of the contract, performance guarantee, subsidies and administrative burden.

The last component of the analysis is a survey consisting of financial instrument which is only sent to the interviewed end-users, a response rate of 81% is achieved. From the survey, it can be derived that the following instruments are expected to be effective: ESCo (overall and utilities), operational lease, rent-buy construction, energy efficiency investment fund, investment subsidy, subsidy for energy efficiency and the target holiday. Although the results of the survey do not portray it, a subordinated loan remains to be perceived as a suitable instrument. It can be concluded that the projects are contextual and there is no "one size fits all" solution.

It is recommended that a risk assessment tool is developed to standardize the evaluation procedure and to overcome the knowledge barrier between institutional investors and the industry. It will lead to increasing understanding as the threshold for institutional investors to invest in industrial energy efficiency projects is lowered and the knowledge barrier overcome. The risk assessment tool is to be linked to an energy efficiency investment fund to finance profitable sustainability projects. The fund can be used for various purposes, ideally it is used for financing projects in the form of subordinated loans, subsidies or providing guarantees.
More conversations between industry and government are encouraged and is it recommended that officers of RVO and regional officers are linked to each other for company visits. Also, it is observed that the the ownership of the equipment is becoming less important with the focus shifting to the use of the equipment. This calls for new business models. It is therefore recommended that the industry, especially technology suppliers, set its course towards the development of new business models where the focus is on the energy savings and the use of the equipment instead of the ownership. Lastly, is it recommended that the findings of this study are used for further research from other viewpoints (e.g. financial managers or decision makers) and focusing on specific target groups (e.g. per sector).

Acknowledgements

Writing a master thesis is, to say the least, challenging. It has been an exploration where I have discovered my strengths and weaknesses. This report is the result of an adventure with glorious moments, valuable epiphanies and of course several breakdowns. Looking back, there are many aspects I would do differently. Nonetheless, I am grateful for this opportunity and I hope that this report satisfies the needs of its readers.

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List of abbreviations

Capex	Capital expenditure
CCS	Carbon Capture and Storage
DEI	Demonstratie-Energie Innovatie
EED	Energy Efficiency Directive
EIA	Energie-Investeringsaftrek
EU ETS	The EU Emissions Trading System
FASB	Financial Accounting Standards Board
GHG	Greenhouse gas
HSE	Health, Safety and Environment
IASB	International Accounting Standards Board
IEA	International Energy Agency
IFRS	International Financial Reporting Standards
IRR	Internal Rate of Return
MEE	Meerjarenafspraken energie-efficiëntie ETS-ondernemingen
MJA3	Meerjarenafspraken energie-efficiëntie 3
NEV	Nationale Energieverkenning
NPV	Net Present Value
Opex	Operational expenditure
PB	Payback period
PJ	PetaJoule
PPP	Public-private partnership
RVO	Rijksdienst voor Ondernemend Nederland
SDE+	Stimulering Duurzame Energieproductie
SRI	Socially Responsible Investment
GAAP	Generally Accepted Accounting Principles
VROM	Ministerie van Infrastructuur en Milieu

1. Introduction

"We face a moment of opportunity, but also of great risk."

- Maria van der Hoeven
International Energy Agency
(International Energy Agency, 2015a)

This statement made by Maria van der Hoeven, executive director at the International Energy Agency, sums up the current state the world is in fairly accurate. The world is in a dire state with finite resources, a growing population and increasing concerns for the effects of climate change (WWF, 2014). In December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal that will take effect in 2020. The goal is to limit global warming to well below 2°C to avoid irreversible alterations due to climate change (European Commission, 2016a)(The Intergovernmental Panel on Climate Change (IPCC), 2014). To achieve this goal, global greenhouse gas (GHG) emissions will need to be decreased. This can be done in several ways, one of them being improving energy efficiency.

To improve energy efficiency, the Trias Energetica model can be followed which is a three-step guideline (see figure 1). It is pleaded that the first step is researching the opportunities for saving energy. Thereafter, the use of renewable energy sources should be explored and lastly should the use of finite resources be as efficient as possible (Korbee, 2013). This concept is also known as the Trias Energica or Trias Ecologica (Entrop & Brouwers, 2009). It is the most applied strategy for constructing sustainable energy efficient buildings and it is also perceived as the most cost-effective solution. (Rijksdienst voor Ondernemend Nederland, 203) (VROM, 2010) These positive remarks illustrate its effectiveness, it is however not applied in the industry yet. The same model can be applied in the industry and should be adhered to as a guideline. This research focuses on the crucial first step of the Trias Energetica model.

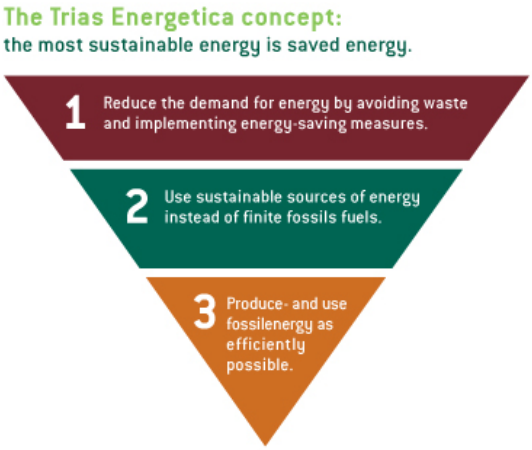


Figure 1 Trias Energetica model (Eurima, 2011)

For a sustainable energy future, renewable energy and energy efficiency are both important. Sustainability is a comprehensive concept and can be defined differently by various stakeholders. This research follows the statement of sustainability as defined by Brundtland stating that sustainability is "*to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs*" (World Commission on Environment and Development, 1987). Although the energy consumption in The Netherlands is declining at a slow pace (Energieonderzoek Centrum Nederland, 2015), additional measures are needed to reach national goals and to achieve an efficient and sustainable society for future generations. In the last years renewable energy has been in the spotlight, whilst energy efficiency is an underestimated concept (REN21, 2015). With a glimpse back on the Trias Energetica model, this is counter-intuitive as the model states that the focus should first be on energy efficiency and then on renewable energy.

Fortunately, a positive development can be observed where energy efficiency is taking its place as a major contributor in achieving sustainability targets and mitigating climate change (Thoyre, 2015), (Schleich, 2011; Worrell, Bernstein, Roy, Price, & Harnisch, 2009). The concept is gaining attention as a key resource for economic and social value. Increasing energy efficiency can provide a wide array of benefits such as promoting a more efficient and prosperous economy, reducing costs and influencing the move towards a fossil-free future (Herring, 2006). Based on the New Policies Scenario of the International Energy Agency (IEA), it is estimated that there is unrealised energy efficiency potential in every sector. As can be observed in figure 2, the industry is at approximately 40% of its energy efficiency potential. The New Policies Scenario of the IEA takes into account implemented and announced commitments and plans that address energy related challenges (International Energy Agency, 2012).

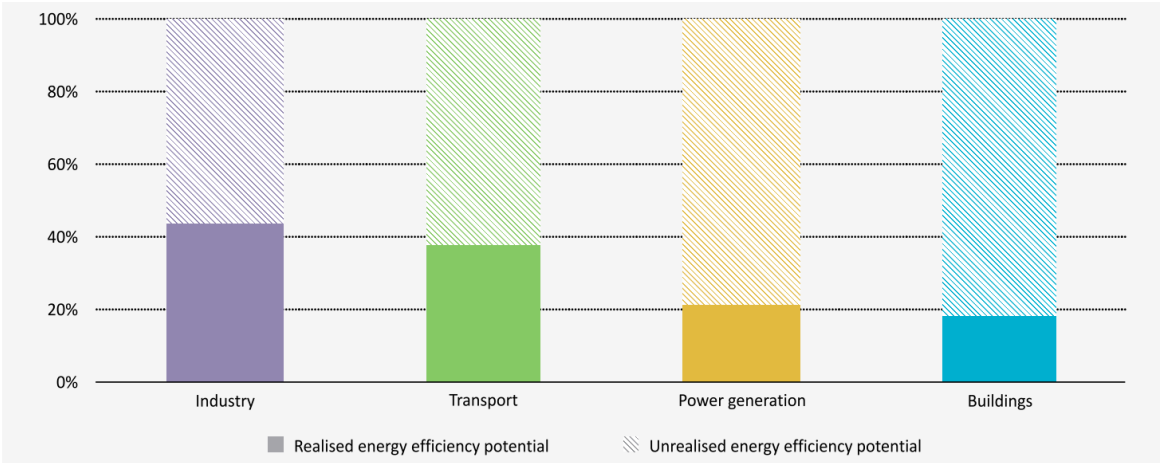


Figure 2 Long-term energy efficiency economic potential by sector *source: (International Energy Agency, 2014a)*

Energy efficiency has climbed up the ladder of visibility, it has changed from the identification as a "hidden fuel" to being increasingly recognized as the "first fuel"(REN21, 2015). It has moreover become a pillar of the global development goals and it is also included in the United Nations Sustainable Energy for All initiative (International Energy Agency, 2014a). Growth is often perceived as enquiring more or expanding, whilst many do not realise that by investing in energy efficiency in the current infrastructure, costs are reduced that can be used for other

purposes and market positions can be enhanced (Santen, 2014). Furthermore, as the future of energy prices is uncertain, companies with an efficient system are less vulnerable to volatile energy prices.

1.1 Focus of the research

The Netherlands has set a national goal of 14% share of renewables by 2020 and 16% share of renewables by 2023. Currently, the share of renewables is 5.6% (Ministerie van Economische Zaken, 2016). In figure 3 it can be observed that the Dutch industry is responsible for approximately one third of the total national energy consumption. It is a major consumer and as it is the largest of all sectors, measures in this category are expected to have the most impact. The focus of this research is therefore on energy efficiency in the industry as it is believed that advances made in this sector can have a positive effect on a short term which may help in achieving nationally set sustainability goals.

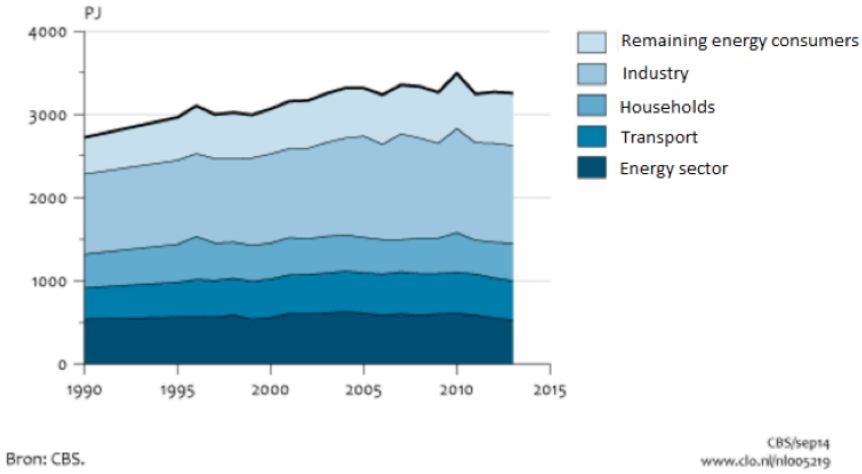


Figure 3 Energy consumption per sector *source:* (CBS, 2014)

According to the abatement cost curve of McKinsey and Company, it is economically more cost-effective to focus on energy efficiency (in the industry) than on renewable energy technologies or Carbon Capture and Storage (CCS) technologies, this can be observed in figure 4 (McKinsey & Company, 2009). The greenhouse gas (GHG) abatement cost curve quantifies various abatement measures in abatement cost and abatement potential. It is an attempt to globally map opportunities to reduce greenhouse gas emissions across different sectors and regions. The width of each bar represents the potential to reduce GHG emissions per mechanism and the height represents the average cost of avoiding 1 tonne of CO_2 equivalent by the year 2030 with that measure (McKinsey & Company, 2009). This finding is thought-provoking as it illustrates the distortion of how capital is allocated with the focus being on renewable energy, whilst energy efficient measures are economically more interesting. Furthermore, according to the International Energy Agency, energy efficiency is one of the cheaper options to reduce CO_2 on a large scale whilst positively influencing economic growth and reducing costs (International Energy Agency, 2012).

When observing Dutch national policy, a focus on renewable energy can be observed for which various instruments have been introduced for stimulation. However, when looking back at the Trias Energetica model, the first step towards an efficient state is focusing on energy efficiency and followed by implementing renewable energy sources. The demand of energy should be

lowered by avoiding waste and by introducing energy saving measures. Only then, sustainable energy sources are implemented to lower the use of fossil resources. Following this chain of thought, it is logical to adhere to the guidelines in this order as a decrease in demand will result in a higher percentage of renewable energy in the total energy mix. This will also increase the likelihood of The Netherlands achieving its national set sustainability goals. Energy efficiency in the industry is disregarded while this sector is the largest energy consumer. This observation underlines the importance of this research where investing in energy efficiency is a cheaper option than investing in renewable energy.

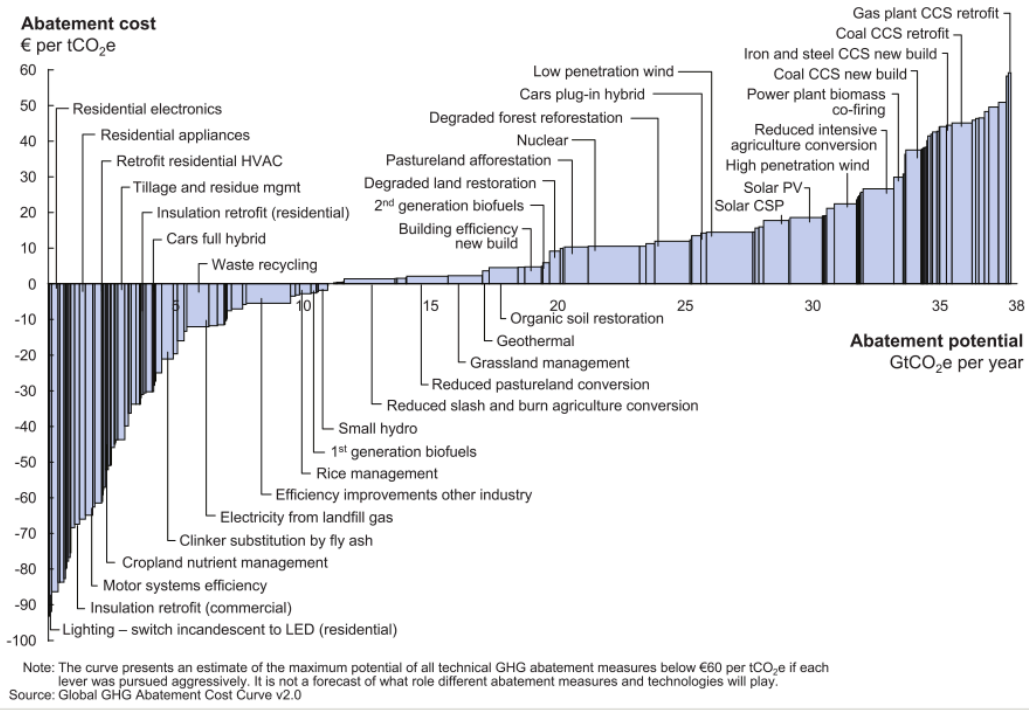


Figure 4 Global GHG abatement cost curve from business as usual to 2030 (McKinsey & Company, 2009)

Increasing the energy efficiency in the industry will have multiple benefits. In a report written by the IEA, the multiple benefits of energy efficiency are described and the most prominent identified benefits can be observed in figure 5. Aside from the prominent benefits depicted in figure 5, other benefits are economic growth and increasing competitiveness (Eichhammer, 2015). Furthermore large amounts of energy can be saved and CO_2 emissions reduced if manufacturing operations are improved. Think of air leaks and poorly maintained insulation that contributes to the use of more energy than is actually needed (The Intergovernmental Panel on Climate Change (IPCC), 2014).

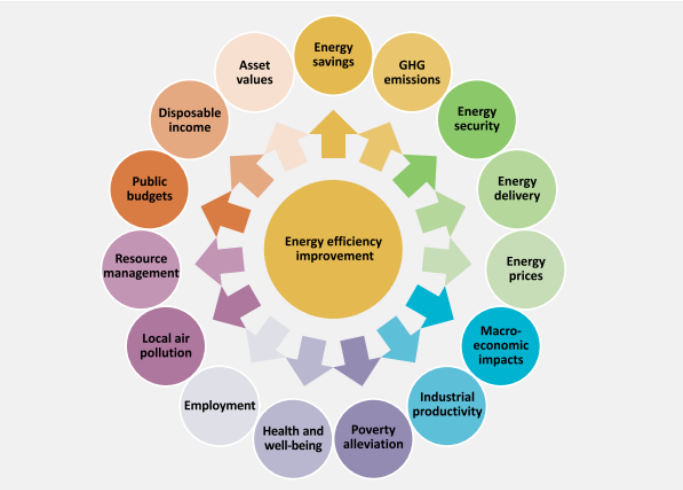


Figure 5 Most prominent identified energy efficiency benefits *source: (International Energy Agency, 2014a)*

Opportunities with potential for a sustainable future are being undervalued and there is a missing link between industry and capital. This mismatch can be regarded as a window of opportunity where capital can be linked to funding energy saving projects which can unlock the potential energy efficiency in the industry. This is not only beneficial for industrial companies and investors, but will also result in multiple benefits for society. It will accelerate the energy transition and strengthen the market position of The Netherlands (Jongsma, 2012).

1.2 Scope

For this research project, it is of importance to define the boundaries of the research. Energy efficiency is a broad phenomenon and encompasses multiple topics. It can be approached from different perspectives (e.g. social, technical, environmental) and is moreover not the result of only one perspective. Energy efficiency is dynamic and this research is mainly focused on researching one barrier which is the access to capital. In the following text, it will be defined what is included in this research and what is outside of the scope.

In scope:

- Understanding the access to capital-barrier
- Understanding the financial management of a company, with a focus on the access to capital-barrier
- Gaining insights in how energy efficiency projects are categorized in the investment strategy of a company
- Exploring existing financial instruments and mechanisms that stimulate industrial energy efficiency
- Analysing which financial instruments could aid in eliminating the access to capital-barrier.

To investigate how the capital barrier can be overcome, it is critical to understand the existence of barriers withholding energy efficiency and in particular the access to capital barrier. Furthermore, as financial instruments are needed to unlock the potential of energy efficiency, understanding important financial terms and effects is needed to propose suitable solutions. To understand if improving energy efficiency is of interest on the company level, companies are asked to share their internal investment categorization. This will provide insights as to how

energy efficiency is ranked and if it can be identified as a driver for sustainable growth. Lastly, it is essential to explore existing and potential financial instruments that could be implemented to overcome the capital barrier.

Outside scope:

- The dynamics of energy efficiency
- The dynamics of the energy transition
- The rebound effect
- Researching the barriers intensively including their relationships
- Researching the decision making process at a company in depth taking into account cultural aspects
- Researching technologies that could improve energy efficiency and defining their potential
- The effect of changing accounting standards on balance sheets
- The effect of changing accounting standards on off-balance arrangements
- The effects and importance of corporate finance and corporate governance
- The effects of national and European policies on the Dutch industry

The dynamics of energy efficiency and the energy transition are outside of the scope of this research as it involves a variety of subjects. Understanding the dynamics of both can only be done if research is performed on the separate elements influencing energy efficiency and the energy transition. This study focuses primarily on the capital barrier, which is why the dynamics are not taken into account. The rebound effect encompasses that improving energy efficiency may not directly lead to an energy saving. Conversely, it may lead to more energy being consumed (Gillingham, Rapson, & Wagner, 2015). The amount of energy used before and after implementation of a project is not taken into account as this is not the focus of the research.

Furthermore is the existence of the barriers researched, but not in depth in such a manner that the relationship and dynamics between the barriers is studied as well. This is deemed unnecessary as the focus is solely on overcoming the capital barrier. In the interviews, the internal investment categorization of companies is analysed. How the decisions are made, who the decision makers are and how a project is proposed are not questioned during the interview. This does not provide additional insights for this research. The same can be said for technologies that can improve energy efficiency. As the focal point is on overcoming the capital barrier, the availability and the potential of energy efficient equipment will not increase understanding or provide more depth to this research.

This study does not research the effects of changing accounting standards on balance sheets or off-balance arrangements. In-depth knowledge from a financial and technical perspective is necessary to understand the effects and limitations, this supersedes the goal of this study. It is moreover expected that companies have internal rules they have to abide to. This may be to satisfy an overseas mother company or to satisfy investors. To what extent these rules are relevant when making decisions is not taken into account for this study as multiple companies are interviewed and knowledge regarding internal structures is necessary to correctly judge the findings in this perspective. Lastly, are national and European policies introduced but not researched as it would take a lot of time to properly understand the mechanisms, alterations and effects from various viewpoints.

1.3 Research question and objectives

This thesis is dedicated to identifying the barriers withholding the potential of energy efficiency in the industry and to research and propose possible (financial) mechanisms that can be implemented so that more projects, aimed at energy efficiency, are executed. It will do so by conducting interviews with companies, focusing on business cases where the payback period is two to five years. The interview will be semi-structured leaving room for problem-specific answers on one hand and using a standardised format that is replicable for all interviews, which increases data reliability, on the other.

The core of the research are the company interviews to understand how energy efficiency investments are categorised on a company level, what withholds energy efficiency and which elements of a financial instrument are of importance. The interviews are crucial, as it will demonstrate if companies are willing to overcome the barrier and which mechanism would be suitable. This leads to the main question:

Which financial facilities should be implemented before 2023 to eliminate the capital barrier of energy efficiency and by doing so, improving energy efficiency in the industry and unlocking its potential?

The main question mentions a specific time frame, before 2023. This moment is selected due to nationally set sustainability goals. In 2023, the goal of 16% renewable energy in the energy mix should be achieved. In the National Energy Outlook 2015 (NEV) it is estimated that with current policy, 15.1% of the energy mix will be renewable energy in 2023 (Energieonderzoek Centrum Nederland, 2015). As mentioned before, the percentage is currently set at 5.6%. With the industry having potential projects that can have substantial effects in a short period of time(2-5 years), a share of 16% renewable energy should be achievable.

To answer the main question, several sub-questions guide the research and help in obtaining the information needed for this research. The sub-questions are divided into five categories; literature review regarding energy efficiency and financial management, the interviews with the technology suppliers and end-users and the follow-up survey.

Energy efficiency

- What are the barriers withholding energy efficiency?
- What research has been done on the capital barrier?

Financial management

- Which financial instruments are already in place?

Interviews – Technology suppliers

- What kind of solutions have technology suppliers come up with themselves?

Interviews – End-users

- What are the barriers withholding business cases with a payback period of two to five years from implementation?
- Which elements of a financial instrument are of importance?

Follow-up survey

- Which financial instruments would be effective?

1.4 Literature review: barriers

As energy efficiency is increasingly being identified as a first fuel and as an aspect with much potential to decrease CO_2 emissions, research into the different barriers withholding its potential has been a focus of many researchers. The term 'barrier' is contested and can be confusing (Sorrell, Mallett, & Nye, 2011). Following Sorrell et al, the definition of a barrier to energy efficiency is: *"a postulated mechanism that inhibits a decision or behaviour that appears to be both energy efficient and economically efficient"* (Sorrell et al., 2011). Many studies have been done that investigate the barriers preventing projects, where a higher energy efficiency can be achieved, from being implemented. The result is a large collection of observed effects and barriers. According to Sorrell et al., the bountiful barriers can be classified into six main categories:

1. Risk

Risk is multidimensional and can be observed from different perspectives. Risk can be derived from various sources, being overall economic trends, potential changes from government policy, price volatility of energy and raw materials, financing risks or technical risks (U.S. Department of Energy, 2015) (Sorrell et al., 2011) (Schleich, 2011). However, the main barrier covering these aspects is how risk is interpreted and how they are perceived.

2. Imperfect information

Individuals do not possess the available information on certain technologies or on the possibilities of improving energy efficiency. Monitoring is not standardised, as a result companies lack the overview of energy consumption in each step of the process or of the company as a whole (Brunsting, Straver, & Vringer, 2015) (International Energy Agency, 2012). Furthermore could it also be that organizations lack the adequate information regarding available energy efficient technologies (United Nations Foundation, 2007) (Fleiter, Worrell, & Eichhammer, 2011).

3. Hidden costs, hidden potential

Predicting the energy reductions as a result of a implementing a measure or new technology is difficult. An improvement in energy efficiency is often a side effect of a project and the estimations tend to be overestimated (Price & Mckane, 2009). Hidden costs cover multiple aspects, such as the overhead costs of energy management and unexpected costs due to performance of the energy efficient technology (increased noise) (The Intergovernmental Panel on Climate Change (IPCC), 2014).

4. Access to capital

This barrier can be described from various perspectives. Internally, it could be that the yearly allocated budget for investments does not allow it or that projects, where an improvement in energy efficiency is a side-effect, are not prioritized (Granade et al., 2009) (Golove & Eto, 1996) (U.S. Department of Energy, 2015). Externally, companies may not be able to raise sufficient funds, the financial sector itself is a constraint or the company is reluctant to use external funds (Schleich, 2011) (Price & Mckane, 2009).

5. Split incentives

With many different functions in a company come split priorities and split responsibilities. Improving the energy efficiency at a company is often the result of enthusiastic employees or

internal sustainability/efficiency goals (Brunsting et al., 2015) (Rosenkranz, Muehlfield, & Dirkmaat, 2013). If there is no incentive or personal interest to advocate energy efficiency improvement, the concept is not prioritized nor measures executed. Furthermore, there could be a principal-agent problem where the interest of the agent differs on certain grounds with the priorities or interests of the company (Gerarden, Newell, & Stavins, 2015). For example, a process engineer is working at a plant. The engineer is responsible to ensure a continuous process and is judged based on that aspect. It is, however, also expected of him that he investigates the efficiency of the process resulting in suggestions for improvement. The engineer is nonetheless criticized upon continuity and not on energy efficiency, introducing a split incentive between the engineer his responsibilities and what the company demands of him.

6. Bounded rationality

Decision-making processes do not always follow the logic of economic rationality (Sorrell et al., 2011). With bounded rationality, it is assumed that optimal decisions are made and not the best decisions. This is due to limited information, satisficing elements, complex environments and limited cognitive aspects (Jones, 2003) (Gerarden et al., 2015). This could result in focusing solely on core activities for example, while investments in other projects besides the core activities would be more beneficial for the company on a long term (Jongsma, 2012).

1.5 Scientific contribution and the knowledge gap

The barriers are not separate entities. An explanation as to why projects are not implemented is regularly that it is due to a combination of barriers and the interaction between them. It is difficult to discover what the real limitation is when multiple elements are closely related to each other and where actors may not be truthful regarding their intentions. In literature on energy efficiency, not much can be found regarding concrete plans on how to overcome these barriers. This research focuses on the practical side of the capital barrier and aims to present tangible and realistic recommendations to implement more energy efficiency projects in the industry.

Since the 1990s, the use of energy efficiency policies in the industry has increased significantly in many developed and developing countries. A review of 575 policy measures, as of 2010, concluded that supportive policies are the most common (40%), economic instruments follow (35%) and at last measures such as regulatory approaches and voluntary actions (24%) (Tanaka, 2011) (The Intergovernmental Panel on Climate Change (IPCC), 2014). A measure with much impact would be to standardise energy monitoring at companies to increase awareness on the energy use and to provide insights on the energy consumption of separate process steps in the production process (Brunsting et al., 2015) (Price & Mckane, 2009).

In the Energy report developed by the Ministry of Economic Affairs, energy efficiency is considered as a contributor in strengthening competitiveness on a global scale. Aside from energy efficiency, it is stated in the report that the ministry has chosen to focus on several subjects being process heat in the industry, promoting renewable energy, sustainable residential heating and transport (Ministerie van Economische Zaken, 2016). When looking at current policy, much is invested in renewable energy and a fund is introduced for increasing energy efficiency in buildings. From the industry it is expected that the market will promote energy efficiency by itself (International Energy Agency, 2012). However, derived from conversations with various stakeholders, depending on the market to unlock the potential of energy efficiency

is unproductive. This introduces a conflict where the government considers the Dutch industry as an important stakeholder to maintain global competitiveness, but does not invest in providing solutions to stimulate the industry. A part of the Dutch industry takes part in the long-term agreements between government and industry. These are voluntary, but not without obligations. The agreements lack enforcement and companies are not penalized in the case of non-compliance (International Energy Agency, 2014b). In the case of energy efficiency, it is stated in the Energy Agreement that the government would introduce an instrument to facilitate energy efficiency in the industry (Sociaal-Economische Raad, 2013). Up until now, no measures have been taken or instruments facilitated. This study could aid in increasing awareness in politics and delivering proof that much potential is undervalued (Hieminga, 2013).

1.6 Practical contribution

Practical research on energy efficiency in such a way has not been performed yet. This is understandable as it is a complex subject with multiple stakeholders and various dynamics taking place. An encompassing research has not been done yet and would take a lot of time. Multiple stakeholders and multiple barriers, which are all operating in different environments, increase the complexity of the problem at hand.

The social aspect of the problem is often underestimated (Brunsting et al., 2015), a research done by ECN endorses this and tries to understand the complexity of energy efficiency at a company level from a social perspective. This is investigated by conducting seven interviews. This research approaches the barriers withholding energy efficiency from a different perspective and tries to understand how the financial barrier limits companies from implementing projects. Seven interviews were conducted in an attempt to understand the social aspect of energy efficiency. Three conclusions were deduced from the results; expertise at the company is favourable to implement measures, energy management has a positive influence and internal stimulus are guiding when taking investment decisions. On this note, both studies complement and strengthen each other and can be perceived as puzzle pieces. It is highly recommended that the results of this research are taken into account in future decision-making processes on a political level and increase understanding and awareness at the stakeholders involved.

In the Netherlands, financial constructions such as ESCOs (Energy Service Company), EPCs (Energy Performance Contracting) or (revolving) funds are not widely implemented yet (Sijbrandij & Korbee, 2012). With successful financial mechanisms, energy efficiency is predicted to improve and barriers would be eliminated or positively affected (United Nations Foundation, 2007). An example of a successful financial construction is an energy efficiency programme in Kenya, which is acknowledged due to its sound institutional framework and the active participation of the private sector, or the ESCO construction in The United States. Powerful tools during that programme have proven to be demonstration projects and experience sharing (Price & Mckane, 2009). No research on possible financial constructions have been conducted nor on the likelihood of implementation in The Netherlands. More research on the access to capital barrier is meaningful and of great importance as a decrease in industrial energy efficiency can have a significant impact to energy-related greenhouse gas emissions.

1.7 Relevance to Industrial Ecology

Industrial ecology is a discipline that covers many different subjects. Students obtain knowledge regarding scientific principles, social values and the use of various modelling programs. It is a course focused on sustainability and prepares its students for the challenging and uncertain times to come. This research is, compared to other thesis studies done at Industrial Ecology, very practical and an uncommon subject. However, practical studies are needed and with this thesis research it is desired to go one step further than theoretical research. Energy efficiency remains a challenging and vital part of the energy transition and is a critical determinant for future developments. The drivers for energy efficiency differ for each company. It can be driven by regulatory frameworks, such as the long-term agreements made between government and industry (International Energy Agency, 2015b), but it can also be a strategic or operational (reducing costs) decision. Key drivers for the investment decision are diffuse, they can be cost reduction, compliance, increasing value of the company or mitigating risk (Eichhammer & Walz, 2011) (Brunsting et al., 2015). Investors are moreover becoming increasingly aware of the importance to invest in a sustainable future. They are becoming progressively critical on their investments, especially on the sustainability of the investments and the assets (Konig, 2015).

1.8 Relevance to FME

FME is an association for the technological industry. Approximately 2,200 companies are a member of FME and are active in various fields such as automation, electronics and manufacturing (FME, 2016). A considerable amount of manufacturing companies are a member of FME and are active in the field of manufacturing technologies. FME fully supports and advises its members on different fields and is the connecting partner. In this connecting role, it often organizes gatherings for different stakeholders in which it discusses relevant subjects.

FME operates in clusters due to the great diversity among its members with the aim to strengthen the earning capacity of the technological industry. The clusters can be perceived as separate divisions where the cluster managers are responsible for connecting actors and facilitating new initiatives or ideas. Four clusters are currently in place (FME, n.d.):

- FME Cluster Life Sciences & Health
- FME Cluster Built Environment
- FME Cluster Energy
- FME Cluster Agriculture & Food.

Although the clusters can be observed as separate entities, the opposite is true with the cluster managers meeting each other periodically and combining the strength of the clusters when needed.

This research is part of the Cluster Energy. Cluster Energy has organized two round tables in the past two years, one with technology suppliers and one with stakeholders from the entire chain. The topic of discussion was energy efficiency in the industry. Four barriers were recognized:

- Lack of enforcement
- Lack of capital
- Missing an integral approach
- Lack of demonstration/pilot projects

The round tables organised by FME give good insights on how stakeholders experience the energy transition, the effects and the barriers. This research focuses primarily on the 'lack of

capital' barrier. By researching how more energy efficiency projects can be implemented, the business for FME members is positively affected as a great amount of the members are technology suppliers. Furthermore, FME is well connected with various important stakeholders and is able to take on an advising role representing the industry. It is therefore the perfect platform to undertake this practical research which can be used for future research.

1.9 Thesis Outline

In chapter 2, Dutch energy efficiency policy is introduced and presented. In the same chapter necessary financial information is presented as well as existing financial instruments. In chapter 3, the research design for this study is illustrated and the different sections described. In chapter 4, the results of the interviews with the technology suppliers are presented and concluded with an interim conclusion. This chapter is followed by the data analysis of the interviews with the end-users in chapter 5, in which the findings of the interview are presented along with the rankings of the elements of a financial instrument. In chapter 6, the last part of the research is discussed where the results of the survey consisting of financial instruments are summarised. After the data analysis, the results are integrated and discussed in chapter 7. Chapter 8 answers the key findings to the sub questions and answers the main research question. This is followed by a discussion on the limitations and validity of this study. Lastly, chapter 9 presents the key conclusion and presents recommendations for action and further research. The references and the appendices conclude this study.

2. Dutch energy efficiency policy and financial instruments

The Dutch government is committed to European targets, such as the European target to reduce the amount of greenhouse gases by 2050 with 80-95%. Dutch energy supply is strongly woven with European energy markets and therefore joins agreements made on a European level such as the European Emission Trading System (ETS) and the European 20-20-20 targets (Ministerie van Economische Zaken, 2016). In this chapter, Dutch policy and subsidies are presented as well as literature on financial instruments.

2.1 Policy and subsidies

The European Union has decided on three targets regarding climate and energy which have to be achieved before 2020. These are called the 20-20-20 targets that translate into a 20% reduction in greenhouse gas emissions, 20% increase in energy efficiency and 20% of energy derived from renewable sources. The Energy Efficiency Directive (EED) is a EU-wide energy efficiency strategy that is to be incorporated in national law per June 2014 (The Coalition for Energy Savings, 2013) and is introduced to attain the European target for energy efficiency (European Environment Agency, 2015). The EED is incorporated in Dutch regulation in the form of compulsory energy audits which have to be performed every four years. Dutch authority is responsible for the evaluation of the energy audits, The Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland, RVO) has an advising role if deemed necessary (Mansveld, 2015). The effects of the implementation of the energy audits in Dutch industry are limited as this element is already included in the long term agreement between government and industry. Following the guidelines of the EED, 3000 companies are obliged to perform an energy audit of which 1100 companies take part in the MJA3 covenant (Mansveld, 2015).

Dutch energy policy has a greater goal, which is to limit climate change and to ensure a safe, reliable and affordable energy supply for its citizens and the industry (International Energy Agency, 2014b). Nationally, the Dutch government has set several national targets for the coming years. Many current goals are based on the agreements made September 2013 when 40 organisations signed the Energy Agreement in which the EED targets are incorporated (Energieakkoord voor duurzame groei)(Sociaal-Economische Raad, 2015).
The Dutch energy (efficiency) policy already consists of several regulatory frameworks and subsidies. The relevant regulatory frameworks and subsidies are:

- Long term agreements (MJA, MEE)
- Dutch Environmental Protection Act
- Energy agreement for sustainable growth
- Green Funds scheme
- Energy investment allowance (EIA)
- SDE+
- DEI

These agreements, subsidies and regulatory frameworks will be discussed in the following text.

2.1.1 Long term agreements

The government and the industry have made long term agreements regarding improving energy efficiency, the result of which are two energy covenants. One is the Meerjarenafspraak Energie-efficiëntie ETS-ondernemingen (MEE) for companies that take part in the European emission trading system and the other is the Meerjarenafspraak Energie-efficiëntie (MJA). In total 1082 companies take part in the energy covenants, of which 110 take part in the MEE (divided over seven sectors) and the remaining take part in the MJA3 covenant (divided over thirty-three sectors) . They are responsible for 830 PJ of primary energy (energy from the source without conversion losses), which is 80% of the total industrial energy consumption and a quarter of the national consumption (Rijksdienst voor Ondernemend Nederland, 2014).

The MJA covenant was launched with the MJA1 covenant in 1992, it is an initiative of the Ministry of Economic Affairs. In this covenant, the government made voluntary agreements with industries and institutions. Although the agreements are voluntary, they are not without obligations. The focus was on process efficiency and the participating members had to improve their energy efficiency with 2% annually (Volkerink et al., 2013).
After the MJA1, the covenant evolved into MJA2 that would last until 2012. This time not only the Ministry of Economic Affairs was involved as other ministries joined. The focus remained on process efficiency, with a broadening to renewable energy and chain efficiency (Rijksdienst voor Ondernemend Nederland, 2014).

The MJA2 was such a success, that it developed into the MJA3 covenant which was implemented in 2008. It is an intensification of the MJA2 covenant, meaning that companies have a target to improve energy efficiency with 30% concerning a period from 2005 to 2020. Furthermore, roadmaps are introduced and the focus is on chain efficiency and sector transcending collaborations(International Energy Agency, 2014b). According to a study performed by Ecorys in 2013, it is concluded that the annual target of 2% energy efficiency saving is not ambitious nor does it result in The Netherlands belonging to the best scoring European countries in this field. However it also concluded that the process, that companies have to follow when agreeing to participate in this long-term agreement, does increase awareness of the subject and the measures that can be undertaken (Volkerink et al., 2013).

The MEE covenant was launched in 2009 and is based on the structure of the MJA3 covenant. The Ministries of Economic Affairs, Infrastructure and Environment and Finance are involved. This covenant is meant for large, industrial companies that are required to take part in the Emission Trading System of the European Union (EU ETS) (Rijksdienst voor Ondernemend Nederland, 2014).

The MJA and MEE covenants will lead to EEPs (Energy Efficiency Plans), which will be composed every four years. The EEPs contain the measures the company plans to implement in the following four years. By using a template provided by RVO, the company gains more insight regarding which measures can still be taken and where opportunities for improving energy efficiency lie. It's also a manner to increase awareness and present the companies' barriers and opportunities in the field of energy efficiency to the board of directors, the trade organisation(s) and the government (Rijksoverheid, 2014). Every four years the plans are updated and evaluated by RVO.

2.1.2 Dutch Environmental Protection Act

The Dutch Environmental Protection Act (Wet Milieubeheer) is the most important legislation for the environment. It can be perceived as a toolbox to protect the environment encompassing general rules for various environmental aspects like waste materials and enforcement. This legislation was put in motion on the 1st of March 1993 (Rijkswaterstaat, 2016). Companies are obliged to implement all projects that have a payback period of five years or less and it is only applicable to companies that take part in the MJA3 agreement. It is furthermore only relevant for companies that use more than 50,000 kWh of electricity and 25,000 m^3 natural gas (NEEAP, 2014).

2.1.3 Energy agreement for sustainable growth

The energy agreement for sustainable growth reflects the willingness of multiple organisations to move towards a sustainable society and economy. It is a voluntary collaboration and represents forty organizations such as environmental organizations, trade associations and financial institutions. The goal of this agreement is to improve energy efficiency, to increase the share of renewable energy in the energy mix and to create at least 15,000 jobs.
In more detail, the following most important targets are set:

- An annual saving of 1.5% of the final energy consumption
- 100 petajoule (PJ) reduction of energy by improving energy efficiency per 2020
- An increase of the share of renewables, 14% by 2020 and 16% by 2023
- At least 15,000 extra jobs in the coming years.

The results will be evaluated in 2016 and 2018. If the results are not satisfactory, additional measures will be taken (Sociaal-Economische Raad, 2013).

2.1.4 Green Funds scheme

In 1995, the government introduced the Green Funds Scheme (regeling groenprojecten) to stimulate the implementation of sustainable projects that are in need of financial support. It is an arrangement that focuses on providing capital against low interest rates, the funders are in turn compensated with a tax advantage. It is a public-private cooperation where private savers, investors and companies can invest in green projects. The funds are earmarked for innovative sustainable projects which amounted to approximately 5 billion Euros in 2012 (Warringa, Afman, & Blom, 2013). Three advantages of this instrument are recognized which are:

- Environmental benefit, reducing CO_2 emissions and improvement of environmental quality
- Technological benefit, lowering the threshold for developing and introducing new and sustainable technologies
- Social benefit, involving citizens, businesses and financial institutions towards a sustainable society. Increasing awareness and motivating for action.

Projects are rewarded with a “certified-green” label if it fulfils the criteria of this instrument (Agentschap NL, 2010). The projects are assessed by NL Agency and the ministry of infrastructure and the environment, green funds and green banks act as intermediaries between the funders and the project owners (Warringa et al., 2013).

2.1.5 Energy Investment Allowance

The energy investment allowance (EIA) is a fiscal incentive introduced by the Dutch government. In this manner, the Dutch government wants to support companies that wish to incorporate energy efficient assets and renewable energy. The ministries of Finance and Economic Affairs are responsible for this incentive, the tax authorities and RVO are responsible

for the execution. A company can benefit from this instrument if he is a taxpayer in The Netherlands and if the asset is on the Energy list with a minimum investment of 2500,- Euro (Rijksdienst voor Ondernemend Nederland, 2016d). The budget for 2016 is 161 million Euro (Rijksdienst voor Ondernemend Nederland, 2016c).

2.1.6 Stimulation of Sustainable Energy Production (SDE+)

The Stimulation of Sustainable Energy Production (SDE+) is an operating grant where the producers of renewable energy receive a financial compensation for the energy they produce. It is aimed to compensate the unprofitable component / inevitable losses as the cost price of renewable energy is higher than that of energy produced by using fossil fuels. The grant focuses on companies, institutions and (non) profit organizations, and can be received for a period of eight, twelve or fifteen years. The amount of the years depends on the technology used. The amount of compensation the applicant receives is dependent on the technology applied and the amount of renewable energy produced. For 2016 the grant can be received for electricity, gas and heat as produced by using renewable energy sources. A combination of heat and electricity is also accepted (cogeneration). The following renewable energy sources are acknowledged (Rijksdienst voor Ondernemend Nederland, 2016f):

- Biomass
- Geothermal
- Solar
- Water
- Wind

The budget for 2016 is set on 8 billion Euro (Rijksdienst voor Ondernemend Nederland, 2016a).

2.1.7 Demonstratie Energie-Innovatie (DEI)

In the Energy agreement, it was agreed upon to introduce an innovation program for demonstration and pilot projects (Sociaal-Economische Raad, 2013). The goal is that The Netherlands is in the top 10 of the global CleanTech Ranking by 2030. To reach this goal, the Demonstration Energy Innovation (DEI) subsidy was introduced. This subsidy targets new applications of equipment, systems or techniques that save energy or promote the use of renewable energy sources. Furthermore, is it a prerequisite that the projects have potential to strengthen the Dutch economy in the field of employment, export and turn-over. With the overall goal being the development of The Netherlands towards a sustainable economy. The budget for 2016 is approximately 36 million Euro (Rijksdienst voor Ondernemend Nederland, 2016b) with pilots for energy efficiency projects being accepted and a rise in subsidy allocation from four to six million Euros (Rijksdienst voor Ondernemend Nederland, 2016e).

2.2 Financial instruments

The Energy agreement also mentions that it will facilitate an extensive financing programme aimed at the investments needed to fulfil the goals set (Sociaal-Economische Raad, 2013). This statement is aimed at renewable energy projects, but also at energy efficiency. However, no instruments have yet been implemented for energy efficiency projects. This research attempts to gain more understanding from the industries' point of view. It also attempts to research what kind of financial instrument would be successful in a way that more energy efficiency projects on an industrial level will be implemented. To identify which financial instruments would be suitable, desk research on financial management and financial instruments is vital. The financial instruments are divided into two categories; instruments that are already in place and potential

instruments. The potential instruments will be introduced and reviewed in chaper 6 as these will be based upon the results of the interviews with the technology suppliers and end-users.

2.2.1 Accounting standards

Periodically, firms publish a report containing financial statements that disclose past numbers and its current financial position. Firms are required to produce four financial statements:

- The balance sheet
- The income statement
- The statement of cash flows
- Statement of changes in shareholders' (or stockholders') equity.

These statements are important tools for the investors, financial analysts and other interested parties that wish to obtain information about the firm (Berk & DeMarzo, 2011). The financial statements also aid in making investment decisions and give information regarding the health of a firm. The health of a firm is judged by its financial ratios. Various financial ratios are of importance such as debt-equity ratio to assess a firm's leverage, solvency to determine if it is able to meet its long-term demands, the price-earnings ratio to measure the market value of a firm and the return on equity ratio to determine a firm's return on investment (Berk & DeMarzo, 2011).

The report should be understandable, reliable and accurate. To ensure reliability, firms are required to hire a neutral third party to perform an audit and check the financial statements. The Generally Accepted Accounting Principles (GAAP) differ among countries. Companies operating internationally can face difficulty interpreting other financial statements due to differences in format and terminology. In 2001, the International Accounting Standards Board (IASB) issued the International Financial Reporting Standards (IFRS) (Pacter, 2015). IFRS is gaining ground as the standard and in 2005 the European Union even required all publicly traded EU companies to follow IFRS. Two countries remained steadfast with their GAAP; the United States and Japan (Berk & DeMarzo, 2011).

When looking at investments, they can be on-balance or off-balance. On-balance meaning that they should be included on the balance sheet, off-balance arrangements do not have to be included. Including equipment or values on the balance sheet will result in changing financial ratios, this is an aspect companies do not desire (Thumann & Woodroof, 2009). On the other hand is it challenging to establish off-balance financing as it is dependent on the division of risk between the participating parties and the ownership of the equipment (Bertoldi & Rezessy, 2005).

2.2.2 Capital budgeting methods

To assess projects and to determine which investment projects to implement, several capital budgeting methods can be used. Investment decision-making is essential for a company as it determines the course you set as a company, as there is a limited budget and as it gives insight in the future benefits in relation to the initial investment (Götze, Northcott, & Schuster, 2008). According to a survey conducted by professors Graham and Harvey in 2001, four capital budgeting techniques are the most popular as highlighted upon by 392 CFOs (see figure 6). These methods are the internal rate of return (IRR), net present value (NPV), hurdle rate and payback period (PB). In recent literature, written from 2000 onwards, the hurdle rate as a method is not underlined nor mentioned as a capital budgeting technique. For this reason, the focus will solely be on the other three methods. In the following text, the capital budgeting

methods are explained and their differences highlighted. After the explanation of each tool, the strengths and weaknesses of each can be found in a schematic overview.

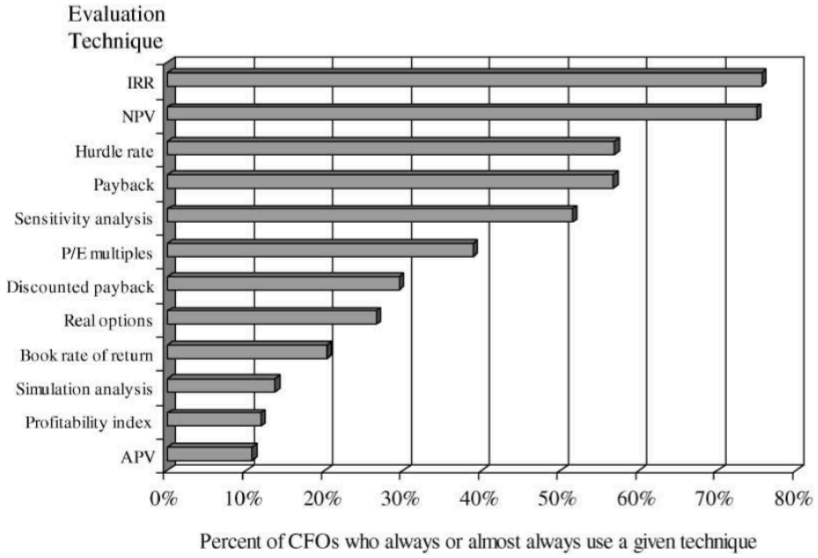


Figure 6 Capital budgeting methods ranked on popularity by 392 CFOs *source:* (Graham & Harvey, 2001)

The **payback period** is a static method that assesses the time it takes to recover the net initial investment of a project (Götze et al., 2008). It is the simplest tool out of the three and based upon the importance of time, which is crucial in the (financial) planning of a company (Pyles, 2014). The concept of time is understandable for many. With time being the essence of this tool, the payback period is a comprehensible and quick method to assess a project. The payback period can be calculated as follows, assuming that the expected net annual cash flow is constant (Pyles, 2014):

$$Payback\ period\ (years) = \frac{net\ initial\ investment}{expected\ net\ cash\ flow}$$

From the result, it is decided if the project is eligible for implementation or not. According to McKinsey and Company, 43% of interviewed energy managers indicated that they stand by a payback period of less than three years for energy efficiency projects. In difficult economic conditions, it is even said that companies abide by a payback period of 18 months or less on all investments (Granade et al., 2009).

Compared to the payback period as a static method, the **net present value** (NPV) tool is more dynamic and is calculated with the present value of the benefits and the present value of the costs (Berk & DeMarzo, 2011). The ambition of a company is to continuously grow and maximise shareholder wealth. To grow, a company needs to implement projects that are worth more after implementation than the net capital investment (Pyles, 2014). The present value is the estimation of the value of a cost or benefit in terms of cash in the present moment. The net present value is the difference between the present value of the benefits and the present value of the costs (Berk & DeMarzo, 2011). The following formula can be used to calculate the NPV (Pyles, 2014):

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_0$$

Where t = time
C_t = net cash inflow during time t
C_0 = initial investment
r = discount rate.

The discount rate is the rate incorporated in the formula that takes into account the value of money that increases or decreases in a certain time frame. It is an essential detail of the NPV method and also one of the many reasons the NPV is a popular method. In general, it is stated that if the NPV is below zero the project should be rejected as it would not bring future benefits. If the NPV is above zero, the projects should be accepted as the company will gain from the project and it will facilitate growth. If the NPV is exactly zero, the company will neither gain nor lose from implementing or rejecting the project (Berk & DeMarzo, 2011) (Pyles, 2014).

Compared to the NPV method, the **internal rate of return** (IRR) method provides a result in percentages instead of units of cash. Although the result of the IRR method increases the ease of comparison, the NPV and IRR method are similar and should provide the same output to base the accept/reject decision on (Pyles, 2014). The IRR method calculates the annual discount rate of a project based on the initial investment and is the rate that leads to a NPV of zero (Götze et al., 2008)(Pyles, 2014). It can be perceived as the rate of growth a project is expected to generate and measures the profitability of potential investments.

The formula used to calculate it relies on the same formula used for the NPV method. However it cannot be ascertained analytically and should be determined on a trial-and-error base (Pyles, 2014). In terms of the result, the higher the percentage, the more beneficial it is to implement the project. According to Berk and DeMarzo, the following rule should be abided: *"Take any investment opportunity where the IRR exceeds the opportunity cost of capital. Turn down any opportunity whose IRR is less than the opportunity cost of capital."* (Berk & DeMarzo, 2011) With the opportunity cost of capital being *"the best available expected return offered in the market on an investment of comparable risk and term to the cash flow being discounted"* (Berk & DeMarzo, 2011).

	Advantages	**Disadvantages**
Payback period (PB)	Simple and easy to apply	Does not incorporate any profits or cash inflows after the PB
	Biases the firm towards liquidity in their capital budgeting decisions	Does not take into account the time value of money
		Difficult to be calculated accurately
		Relies on ad hoc decision criteria (what is the right number of years for the PB?)
Net Present Value (NPV)	Takes into account time and risks	Relies on estimates and assumptions
	Is not arbitrary	Unexpected costs are not taken into account
	Each cash flow is included, accurate depiction of the actual value of the	

	firm	
Internal Rate of Return (IRR)	The result is in percentages; easy to comprehend	IRR and NPV can contradict each other
	Incorporates cash flow	Multiple IRR's if the cash flows are unconventional
	Takes into account time and risks	

Table 1 Advantages and disadvantages of the top three financial indicators used by companies *source:* (Berk & DeMarzo, 2011) (Pyles, 2014) (Woodroof & Thumann, 2013) (Götze et al., 2008)

Although the payback period method has many disadvantages, it remains a popular method which is used by many companies as part of the decision-making process. In the survey, where 392 CFO's were approached, it was found that approximately 25% of the CFO's do not use the NPV method at all although this method is described as the most reliable in literature (Graham & Harvey, 2001). However, the survey conducted by Graham and Harvey may be misleading as it does not take into account the entire decision-making process of selecting suitable investments. It could, for example, be that the payback period is used as a simple method to get a quick sense of the project before investing more time and effort. In this research the payback period is used as the main capital budgeting method as all companies, except for one, use the payback period when referring to investment projects.

2.2.3 Financial instruments in place

Several financial instruments are currently in place which can be implemented by various stakeholders to finance a project, if the accounting rules used by the company are not restricting. These are existing financial instruments that can be utilized to finance energy efficiency on a company level. In the following schedule, the existing financial instruments are described in a table including their advantages and disadvantages. Several of these instruments, like subsidies or a subordinated loan, may be included as a potential instrument to stimulate energy efficiency if such a mechanism has not been introduced for this purpose yet.

Instrument	Description	Advantages	Disadvantages
Bank loan	A loan at the bank (optionally below market interest rate) which can be revoked when the company goes bankrupt or when the agreed period has come to an end.	No ownership position Does not get involved in the business process, flexible for own usage After contract period, bank has no involvement nor is there an obligation The interest on bank loans is tax-deductible Interest rate remains the same during contract period	Risk capital (part of a company's financial management) Is to be paid back first in times of bankruptcy Affects the solvency and credit of a company Strict terms and difficult to obtain Private properties can be used as collateral
Subordinated loan	A loan which is revoked last when the company goes bankrupt. Can be perceived as an investment in the company and is often offered by business	Can be accounted as equity, increasing credibility (and solvency) in some situations. Not applicable for when used for project finance.	When bankrupt, subordinated loans are paid back last Higher risks of no repayment of loan -> higher interest rates

	partners, investors or banks.		Actor providing the loan is exempt from tax-payment of the received interest
Operational lease	Lessor is the owner of the equipment/system and lessee pays back a pre-agreed amount every month	No upfront investment needed Service and maintenance responsibility of supplier After leasing period, equipment/system can be changed Economical risk of equipment after lease responsibility of lessor Off-balance	Equipment is part of the process, which makes it difficult to remove
Financial lease	Lessee is the owner of the equipment/system and pays back a pre-agreed amount every month	Leasing period equivalent to the economical service life of the product, can be accounted as long term assets	Knowledge on equipment/installation in-house needed Service and maintenance responsibility of lessee
Energy performance contract	ESCo (Energy Service Company) responsible for performance risk and credit risk. As ESCO is responsible for funding and performance. If bank financing is used as a third party, bank receives the rights to the stream of payments as security for the loan. Can also be applied only for commodities where the output (steam, heating/cooling) is sold to the customer at an agreed price.	No upfront investment needed No knowledge or extra personnel needed Return on investment guaranteed Service and maintenance done by ESCO Guaranteed energy savings Lower operational costs Custom-made advice and application Energy efficient equipment Reduce risk of plant failure	Built on a relationship of trust (can take a long time to establish) ESCO may have access to confidential information Total amount of payments exceeds the investments done by ESCO Additional savings are shared with ESCO Dependent on ESCO for energy commodities
Tax incentives	Paying less taxes if you invest in renewable energy/energy efficiency.	Cost reduction from investing in energy efficiency and from tax incentive	Subject to “free rider” problem (companies make use of the tax incentive whilst they would also have implemented the measures without incentive)

Subsidies	Capital provided by the government to help an industry, technology or business. Subsidy can be received as compensation for the inevitable losses/unprofitable component of the investment.	Increases the likelihood of success Unprofitable measures are given a chance to develop and grow Positively influences the PB, IRR or NPV May act as an incentive to invest	The subsidized measure may become dependent of the subsidy Clouded profitability Not taken into account in the decision making process due to administrative barriers
Private equity	Investing in early-stage and expansion-stage energy efficiency companies, which are not stock listed, and projects with the potential for substantial capital appreciation. The investor often partners with other specific funds and strategic investors to provide additional equity funding to the investment.	Can be accounted as equity, increasing credibility (and solvency) Gives unlisted companies the opportunity to grow Partnership for a long term Company can make use of the knowledge brought in by the investor	Comes with ownership

Table 2 An overview of existing financial instruments *source:* (Taylor, Govindarajalu, Levin, Meyer, & Ward, 2008)(Bertoldi & Rezessy, 2005) (Buonicore, 2012) (Thumann & Woodroof, 2009) (Eefig, 2015) (Woodroof & Thumann, 2013)

2.3 Chapter summary

The Dutch energy efficiency policy already consists of several regulatory frameworks, arrangements and subsidies. In the Energy agreement it is stated that it will facilitate an extensive financing programme focused at investments needed to fulfil the national set goals for energy efficiency and renewable energy. To propose new instruments for improving energy efficiency, it is of importance to understand financial management. Companies periodically publish a report containing financial statements from which its current financial position can be determined. Companies follow globally accepted accounting standards, two most applicable being IFRS and US GAAP.

To assess projects, capital budgeting methods are used. Three most popular methods are the NPV, IRR and PB. Although PB as a capital budgeting method comes with a myriad of disadvantages, it remains a popular method. In this research the payback period is used as the main capital budgeting method as the majority of the interviewed companies use the payback period when referring to investment projects.

3. Research design

In this chapter an extensive explanation of the research design is given. The research is composed of separate clear defined steps which are needed to answer the research questions found in chapter 1.3. In figure 7 the research design can be observed. The yellow notes indicate the chapter in which this step will be discussed. The coloured arrows indicate what the output and input is of each step.

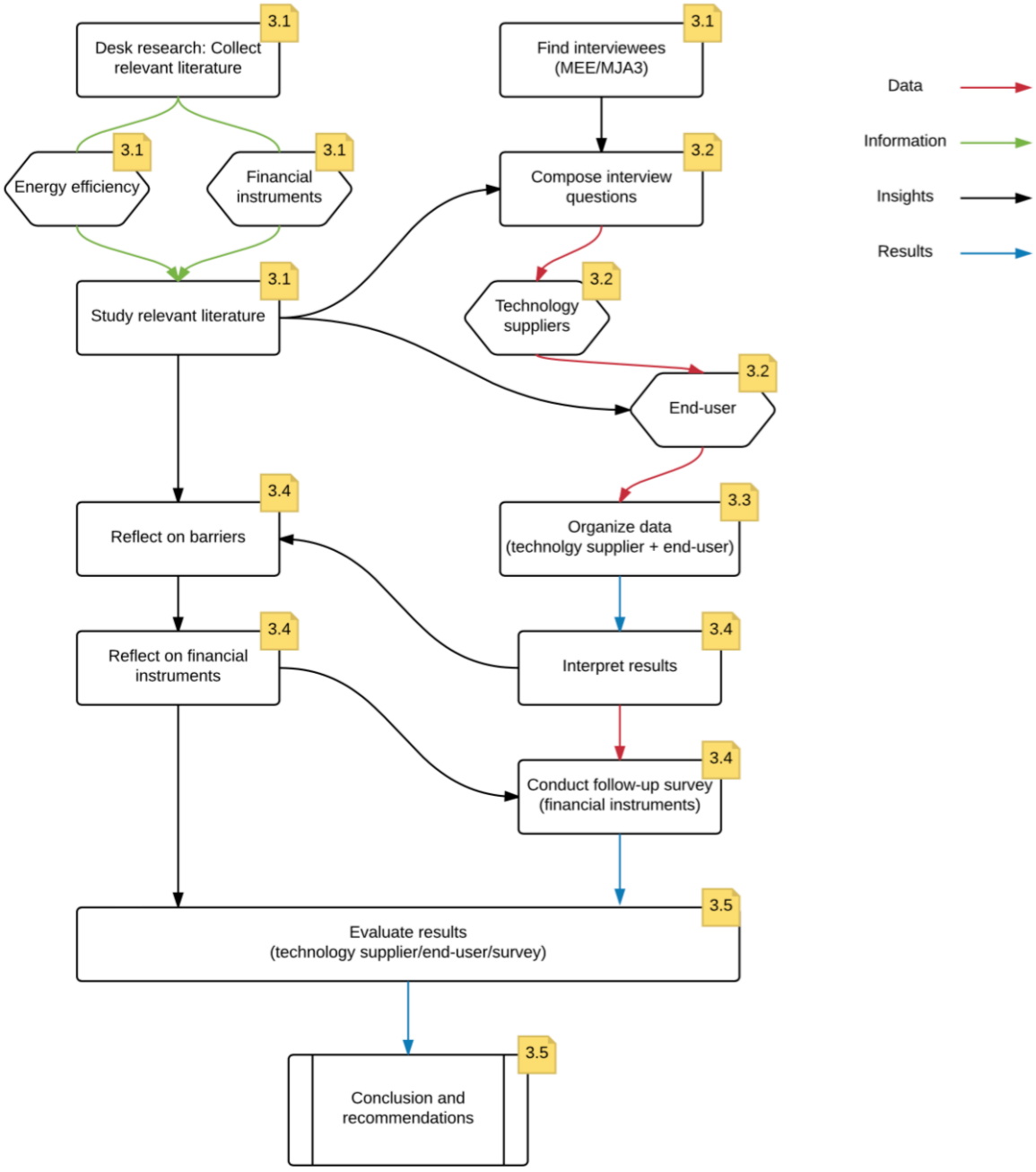


Figure 7 Research design

3.1 Desk research and preparing interviews

To understand energy efficiency, the barriers and the opportunities, desk research is performed to collect data. It is a crucial step as it sheds light on what has been researched before and it is the foundation for the steps that follow. This research is an exploratory study as no similar studies have been done in the past before. Extensive preliminary research has to be done to gain familiarity and to understand the problem at hand before developing a research design. For this research, desk research is performed on two subjects: energy efficiency and on financial management with the connecting element being the financial barrier. To propose financial instruments as a solution, it is of importance to understand the financial barrier and to be aware of what research has been done on this element already. The same is valid for the financial instruments. There are many financial instruments which are already in place or can be suggested, but the devil is in the details. This aspect introduces a complex element to the research in which a strong basis is needed before the research is continued.

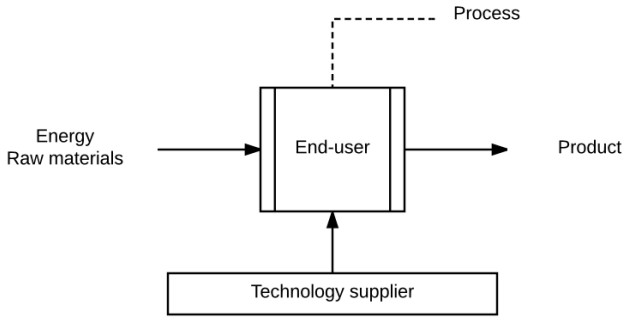


Figure 8 Relationship between technology supplier and end-user

Next to desk research, the interviews are prepared simultaneously. This part of the research encompassed deciding on the target group, which stakeholders to contact and contacting them. It was decided to interview two groups; the technology suppliers and the end-users, their relation can be observed in figure 8. The technology suppliers, in this research, are defined as companies that provide equipment to various parties in the chain of production. It is decided to interview this group as they have hands-on practical experience with energy efficiency and the barriers negatively influencing their business. To continue doing business, there is a possibility that the suppliers have already come up with creative solutions themselves already that could be suitable input for this research.

The end-users are the main focus of this research. The end-users, in this research, are defined as companies that process materials for the market. This can be from raw material to consumer, but also from raw material to an intermediate product for further processing. If any financial instruments are introduced, the end-users are the designated group to implement them. It is therefore vital that their experiences and needs are mapped to propose proper solutions.

For the technology suppliers, companies suggested by the internship supervisor were contacted by e-mail (only FME members). It was decided to contact FME members only as their willingness to cooperate was deemed more likely, ths increasing the effectiveness of the e-mails sent. The e-mail consisted of a concise explanation and background of the research and ends with a call for

participation. As a result, five companies agreed to participate in this research. The e-mail can be found in appendix C.

For the end-users, the target group are companies that take part in the MJA3 or MEE agreement as these companies are responsible for 80% of the total industrial energy consumption. For effective changes in a short time frame, implementation of measures in this group will have the most impact. The companies are selected in three ways with the only prerequisite being that it partakes in the MJA3 or MEE agreement. Firstly, suggestions were made by the internship supervisor based on his network. Secondly, a contact person at RVO send an email to all MJA3 and MEE officers with a call for suggestions. Thirdly, at the end of the interview with the technology suppliers, they were asked if they had any suggestions for interesting companies to contact. With the suggestions and provided contact details, e-mails were sent to the mentioned companies after being cross-referenced with the list of MJA3 and MEE companies published by RVO. The e-mail can be observed in appendix D. Due to the length of the list, it is not included as an appendix in this report. The list of MJA3 and MEE participants can be found on the website of RVO. As a result, sixteen companies agreed to participate in this research. The interview questions were not sent beforehand, except when explicitly asked for by the interviewee.

3.2 Data collection

The data is collected by conducting interviews, which is a useful data collection method when performing an exploratory study (Sekaran & Bougie, 2009). The interviews are one-on-one, for this kind of interview there are three different sort of interviews that can be conducted which are (Baxter, Courage, & Caine, 2015):

- Unstructured interviews
- Semi-structured interviews
- Structured interviews

The three forms come with their own advantages and disadvantages, in figure 9 a comparison can be found between the three forms.

An unstructured interview can be compared to a normal conversation, the results are however difficult to analyse as there is no guideline of pre-defined set of questions. A structured interview, conversely, is a controlled type of interviewing where the interviewee must choose from the options provided. A structured interview can be compared to a survey, but then conducted verbally with the added benefit that the interviewee can explain its answers. (Baxter et al., 2015) A semi-structured interview is a combination of the two forms and consists of pre-defined questions whilst leaving room for discussion and new insights (Wilson, 2014). Following a set of pre-defined questions is helpful for analysing the results so that the interviews can be compared to each other.
For this research, it is chosen to conduct semi-structured interviews. With semi-structured interviews it is possible to systematically gather information about several main topics and in the meantime allow exploration of new topics and discussion (Wilson, 2014). This form of interviewing fits with this exploratory study as (new) input from the interviewees is valuable whilst discussing and answering a set of pre-defined questions which are based on the findings of the desk research.

Interview type	Type of data received	Pros	Cons
Unstructured	Qualitative	• Rich data set • Ability to follow up and delve deeper on any question • Flexible • Especially useful when you do not know what answers to expect	• Difficult to analyze • The topics and follow-up questions may not be consistent across participants
Semi-structured	Combination	• Provides both quantitative and qualitative data • Provides some detail and an opportunity to follow up	• Takes some additional time to analyze participants' comments • Not as consistent across participants as the structured interview
Structured	Quantitative	• Faster to analyze • Questions asked are consistent across participants • You can generally ask more questions than in an unstructured interview	• You may not understand why you got the results you did because participants were not given an opportunity to explain their choice

Figure 9 Comparison of the three types of interview (Baxter et al., 2015)

Pre-defined interview questions

The questions of the interviews are based on the literature found while doing desk research with the final goal of being able to answer the research questions. As two different groups are targeted, the subjects for both target groups differ.

For the technology suppliers, these main categories can be identified:

- How do you convince your customer?
- What kind of barriers do you experience when selling your product?
- What kind of financial solutions have you introduced that could positively influence your business?
- What would you need to scale up this solution?

The input of the technology suppliers together with the literature, form the basis of the questions for the end-users. The technology suppliers were even asked if they themselves had any questions for end-users. This created a bridge between technology suppliers and end-users from the suppliers' point of view as to what remains unknown to them. The data analysis from the technology suppliers was valuable and aided in preparing the questions for the interview with the end-users. The final list of questions for the interview with the technology supplier can be found in appendix A.

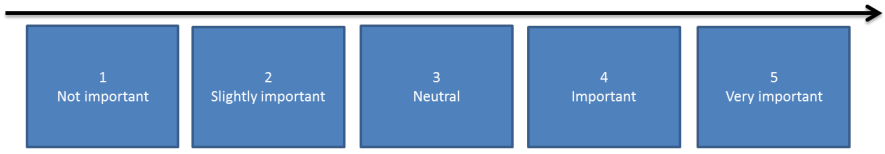
For the end-users, these main categories can be identified:

- Is energy efficiency a subject of strategic value at your company?
- How are investment projects categorised at your company?
- Can you tell me more about projects with a payback period of 2-5 years which are not implemented?
    - What are the barriers?
    - What is the payback period?
    - What is the investment?
    - What kind of investment is it?
- Proposing various options
- No incentive to advance projects, what would help?

- Do you personally have other suggestions?
- Filling in the preference list for the financial elements (see figure 9)

The main questions seen above can be clearly categorized into three different parts; energy efficiency, business cases and financial management and preferences. Both interviews started with an introduction where both the interviewee and the interviewer introduce themselves and explain the background of the research. From this introduction, the interviewer gradually starts to ask questions about energy efficiency and continues to delve into the research topics.

An important element of the interview with the end-user is identifying the important elements a financial instrument has to comply with. The initial idea was to propose different financial instruments during the interview to discover its success. However, as mentioned before, the devil is in the details and especially with financial instruments small changes may seem insignificant, but can change the impact of the financial instrument in entirety. For this reason, it is decided to turn the question around and present various elements of a financial instrument that the interviewee should rank on a scale of 1 (not important) to 5 (very important). Each element is presented and discussed separately, the presented elements to the interviewee can be found in figure 10. The goal of the presented list is to recognize a pattern through which it becomes clear what kind of instrument would be most successful. The final list of questions for the interview with the end-users can be found in appendix B.



Condition	1	2	3	4	5
On-balance / Off-balance	☐	☐	☐	☐	☐
Security	☐	☐	☐	☐	☐
Guarantees	☐	☐	☐	☐	☐
Duration of the contract	☐	☐	☐	☐	☐
Interest + risk premium	☐	☐	☐	☐	☐
Performance guarantiee	☐	☐	☐	☐	☐
Sharing savings with funder	☐	☐	☐	☐	☐
Fluctuating payments	☐	☐	☐	☐	☐
Subsidies	☐	☐	☐	☐	☐
Fiscal incentives	☐	☐	☐	☐	☐
Administrative burden	☐	☐	☐	☐	☐

Figure 10 Presented list of financial elements

The semi-structured interview

The interviews took place at the offices of the companies that agreed to participate in this research, except if the interviewee suggested otherwise. This lowers the barrier for participation and creates a comfortable environment for the interviewee. The interviews were scheduled in for 1.5 hours. Before the interview started, consent was asked from the interviewee to record

the interview as this will increase the reliability of the data. In the invitation e-mail sent to the interviewee it was made clear that all data will be confidential and cannot be deduced to one company. This was repeated again at the beginning and at the end of the interview to increase trust and to remove any uncertainties regarding sharing sensitive information.

3.3 Data analysis

In total twenty one semi-structured interviews are conducted; five interviews with technology suppliers and sixteen interviews with end-users. It is crucial to collect and analyse the data systematically and in an understandable format to find similarities and/or differences between the outputs. This thesis research is an exploratory study and many different subjects are touched upon in the interviews. Also, as they are semi-structured, it is possible that new subjects are introduced which are not included in the question list. This aspect makes it very challenging to code the interviews in such a way as found in literature. In literature, the purpose of coding is to create quantitative data from qualitative data (Saldana, 2009). With the aim and goal of this research, this is counter-productive and may lead to wrong deductions.

The interviews are recorded, with agreement of the interviewee, and worked out afterwards with the recording as a guideline. The contents of the interview are typed out in a rough format alongside the recording. From every interview, the main points and/or striking findings are summarised and included in the rough format. From this format, an Excel sheet is filled in where all answers from the interviewees are processed according to the questions asked. With an overview of all the answers next to each other, it is possible to compare the output and observe relations. The excel sheet gives an overview of all the answers given and makes it easier to process the various answers without going through to all the raw data (the rough format). The excel sheet is then used as input to cluster the answers and companies to see correlations and patterns. The aim of this, being able to propose effective recommendations for the industry where the companies operate in different markets. The steps of this process can be observed in figure 11.

Figure 11 Processing semi-structured interviews

3.4 Interpretation and follow-up survey

After the interviews are coded, intermediary results can be determined as the various interviews can be compared to each other. This goes for the interviews with the technology supplier as for the interviews with the end-user. A crucial part of the interview is ranking various financial elements which are presented during the interview. As a result of this list, a collection of suitable financial instruments is established. The success of these financial instruments is dependent on the end-users, as they are the designated group that should embrace and implement the financial instruments proposed.

The list of suitable financial instruments as a result of the interviews is formatted in the form of a survey. This follow-up survey is sent to the interviewees (end-users only) for feedback which will determine the success and likelihood of implementation. The interviewees are aware of this additional step; their willingness to cooperate is inquired at the end of the interview. Feedback from the interviewees regarding the proposed financial instruments is imperative and increases the reliability and credibility of the research. The process of how the survey is analysed can be observed in figure 12.

Figure 12 Processing surveys

3.5 Evaluation of results

The intermediate results of the interviews and the result of the follow-up survey are evaluated to produce the final results of this research. The final results conclude this research and are used as input to develop the conclusion and the recommendations for further research. The results are used to answer the research questions determined at the beginning of this research and can be used to reflect on the information found during desk research.

3.6 Chapter summary

The research is composed of separate clearly defined steps which are needed to answer the research questions. Starting from desk research, to be interviewed companies arecontacted simultaneously. In total 21 interviews are conducted, 5 with technology suppliers and 16 with end-users. This research is an exploratory study, which is why the approach of a semi-structured interview is selected as most suitable.

The interview with the technology suppliers is mainly focused on gaining insights on the capital barrier and to investigate if they have devised creative, successful instruments themselves to increase their business. The interview with the end-users is focused on how energy efficiency is ranked at the company, how investment projects are categorized and if they have potential projects with a payback period of two to five years. An important section of the interview with the end-user is filling in the list of elements of a financial instrument. The insights gained from the interviews (both technology supplier and end-user) are used to compose a survey presenting financial instruments. The survey is meant as a feedback tool to confirm the findings of the interviews and to discover the effectiveness of potential financial instruments to improve energy efficiency in the industry.

4. Data analysis I – technology suppliers

Technology suppliers are, as the name suggests, companies that supply equipment to various stakeholders in the production chain. These can be (heat) pumps, membranes, heat exchangers, valves and tanks, but also companies that provide services to optimize operations. In this research, the technology suppliers are perceived as a source of knowledge due to their hands-on experience. The technology suppliers and end-users operate in different markets, and as such experience different limitations. To maintain business, it is assumed that technology suppliers have to be creative with selling their products. The technology suppliers provide services or provide energy efficient equipment. Energy efficient equipment results in lower consumption, which can be translated to a cost reduction. Technology suppliers may provide refreshing insights; it is therefore decided to interview technology suppliers and to use the results to devise the questions for the interview with the end-users. A summary of the interviews can be found in appendix G.

4.1 Interview set-up

The interviews with the technology suppliers took place before the interviews with the end-users. Multiple technology suppliers were approached via e-mail, using the contacts from the FME database. The sent e-mail stated the background of the research, the aim of the research and a call for participation. Furthermore was it made clear that all information obtained is confidential and that the companies that participated in this research cannot be deduced from the final results. The letter sent to the technology suppliers can be found in appendix C.

After a positive reply from the companies, a date was set for the interview. The interview was scheduled for 1.5hours and took place at the office of the company itself, unless agreed upon otherwise. A total of five companies participated in this part of the research. The goal of these interviews was to find out how these actors experience the changing business around energy efficiency and the energy transition. It also focuses on the selling points used to convince the customer and on the solutions they have thought of themselves.

4.2 Interview outcomes

This research is an exploratory study. Due to this aspect, various questions were asked that focused on different subjects. The main goal of the interviews was to research what kind of (innovative) instruments already exist in the market and to explore how technology suppliers position themselves in a market with much competition and uncertainty. In the following subchapters, the outcome of the interviews is presented per main category which is deemed as relevant input for the interview with the end-user and for understanding the market.

4.2.1 Selling points

After the mutual introductions and introducing the background and goal of the visit, the semi-structured interview started off with asking the companies what the unique selling point was of their product. The answers given varied and an overview of the answers can be found in figure 13, an explanation of the various responses given can be found in appendix E. The numbers on the y-axes depicts how often the element is mentioned as a selling point, the subjects on the x-axes depict the various selling points mentioned. This depiction of the selling points is useful as it provides insight on how a customer is convinced and which selling points stand out. As can be

seen in figure 9 the main selling points used to convince the customers are reducing costs and unburdening the customer. Energy savings, CO_2 savings and sustainability are equally as important and show that the technology suppliers focus on two main elements; saving money and positive environmental impact.

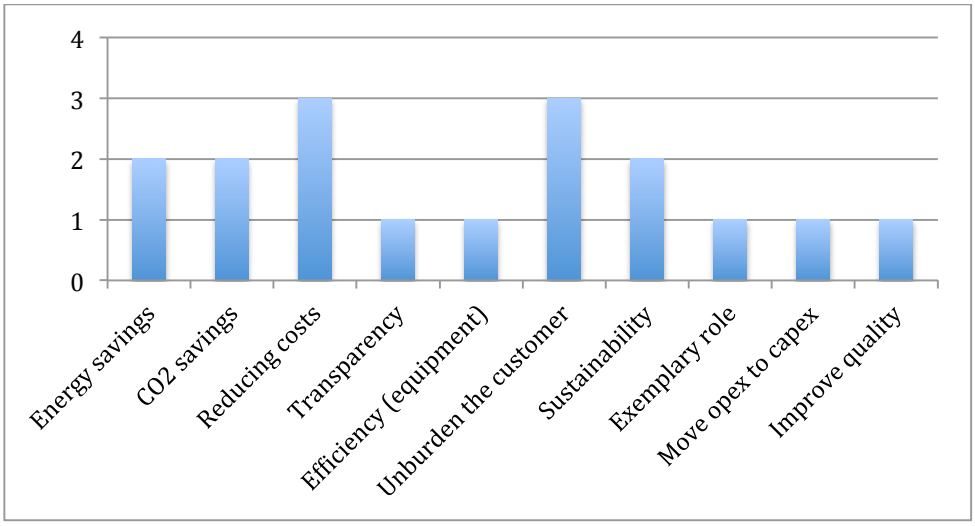


Figure 13 Responses: selling points

4.2.2 Reasons the customer declines

Apart from the selling points, the technology suppliers were also enquired about the reasons a company declines the offer or the equipment. Once again, the answers varied which can be perceived in figure 14, where the x-axes state the different reasons mentioned and the y-axes portray the amount of times the various reasons were mentioned by the technology suppliers. Two reasons stand out; the customer has other priorities and due to financial reasons. With financial reasons is often meant that the payback period is too long. The payback periods offered by two out of six companies were three and five years. This is a relatively short payback period, but apparently their customers do not share the same opinion. However, it should be noted that it is difficult to determine what the exact reason for decline is as companies tend to conceal it. This was mentioned at several interviews with the technology suppliers.

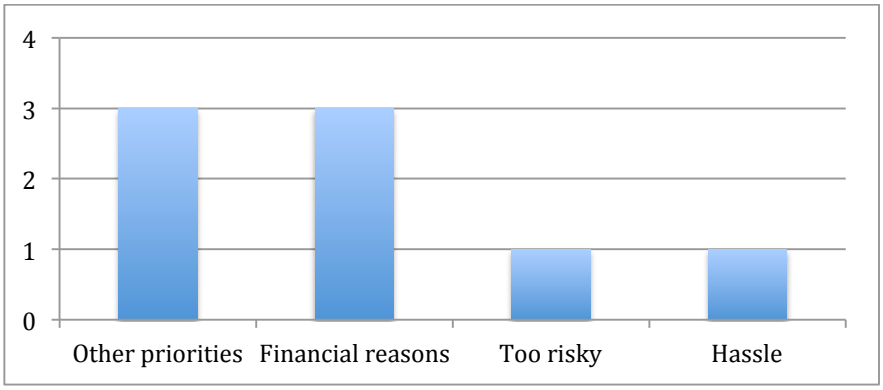


Figure 14 Responses: reasons a customer declines

4.2.3 Own experience

An important element of the interview is the personal experience mentioned by the interviewee as it gives the interviewer an increased understanding and background. The interviewee shared the barriers from their personal viewpoint. These insights increase understanding as to why it is a difficult market. The technology suppliers are most suitable actors to receive input from as they encounter these problems in the field on a daily basis while doing business.

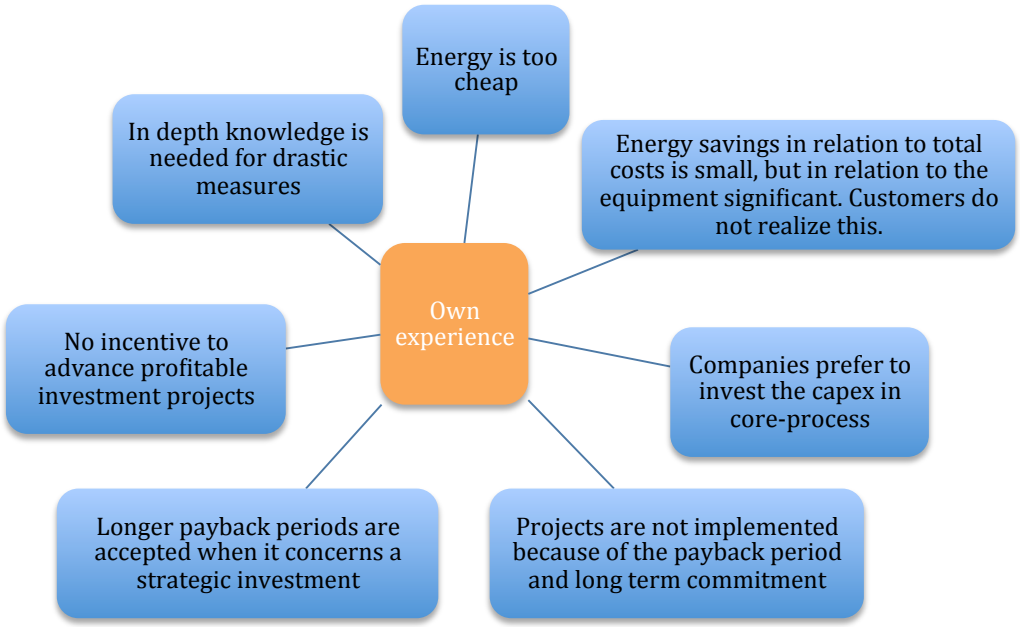


Figure 15 Experiences mentioned by interviewees

The experiences shared are very diverse and give a good overview of the barriers encountered while doing business, see figure 15. The findings obtained are used as insights for the interview with the end-user. Some comments are relevant for the interview with the end-user in which the motive can, hopefully, be detected. As example, it is observed that companies prefer to invest the capital expenditure (capex) in the core-process. This statement can be tested in the interview with the end-user and the motives discovered. The same is applicable to the comment that there is no incentive to advance profitable investment projects. The absence of such an incentive seemingly also influences the technology suppliers. An incentive to advance projects would thus work for both parties. The end-users could implement more projects, which will result in more equipment needed, positively influencing the business of the technology suppliers. The answers given show a tip of the iceberg of what can be expected and demonstrate both parties are closely related to each other.

4.2.4 Solutions

One of the main reasons to conduct interviews with technology suppliers was to gain insight in the solutions offered to the client. From the answers given in chapter 4.3, it can be concluded that the technology suppliers encounter many barriers. Many of which they themselves do not control. To survive in a dynamic market and to sell products, technology suppliers may have constructed unconventional solutions. From the interviews with the technology suppliers, three solutions are mentioned:

- Rent-buy construction
- ESCo
- Financial/Operational lease

The **rent-buy construction** entails that the technology supplier rents the equipment to the client for a certain period of time. The contract period is linked to the payback period of the project, the duration of the contract is open for discussion. In the example given by the interviewee, the duration of the contract was determined by payback period + 1yr to create a win-win situation for both parties. The equipment would be on the balance sheet of the technology supplier for the contract period, it would be off-balance for the customer. After the contract period, the equipment is taken over by the customer for a predetermined amount. Disadvantages of this solution are the scalability and the juridicial details. The scalability of this solution is restricted as the balance sheet of the supplier is limited, implementing this instrument on a great scale would require more capital influx for the supplier. Also, at the moment of conducting the interview, the legal details of the solution were disputable. As such, the construction as it is cannot be implemented on a considerable scale yet, but does demonstrate potential and creativity.

ESCO constructions are gaining ground globally as an instrument that can cost-effectively reduce pollution and help companies in achieving their sustainability targets, without front-end capital expenses. The projects costs are paid from the savings and both parties benefit from the arrangement (Hansen, 2011). But what is an ESCO? According to the latest German energy efficiency action plan to the European Commission the definition of an ESCO is the following:

" Energy-Contracting - also labeled as ESCO- or energy service - is a comprehensive energy service concept to execute energy efficiency and renewable projects in buildings or production facilities according to minimized project cycle cost. Typically an Energy Service Company (ESCO) acts as general contractor and implements a customized efficiency service package (consisting of e.g. design, building, (co-)financing, operation & maintenance, optimization, fuel purchase, user motivation). As key features, the ESCO's remuneration is performance based, it guarantees for the outcome and all inclusive cost of the services and takes over commercial as well as technical implementation and operation risks." (Bleyl & Seefeldt, 2012)

In the solution given by one of the interviewees, the company offered the same construction and was responsible for the design, the implementation, maintenance and financing of the asset. The contract period was not standardised and is upon agreement between both parties. The interviewee mentioned that it preferred to remain the owner of the asset. The solution is standardised and can be implemented on a considerable scale. The solution offered, however, has only been implemented for utilities and not in assets incorporated in the core process. This

requires trust, due to sensitive information, and increases complexity as other aspects come in play. Furthermore are ESCo constructions are a sort of operational lease, which are off-balance. However, establishing an off-balance construction (and keeping it off-balance) can be strenuous as the off-balance positioning is dependent of various factors. It is for example dependent on the ownership of risk and the ownership of equipment.

The last solution proposed by the technology suppliers is an **operational or financial lease**. The interviewees shared with us that a lack of finance is often used as a reason by the end-user to not continue with the proposal. To convince the customer, an operational or financial lease is offered. A financial lease is an arrangement where the customer (lessee) pays back the asset periodically to the supplier (lessor). The asset will be included on the balance sheet of the lessee. During the interviews, it was also mentioned that if the customer was not interested in a financial lease, then an operational lease was offered. An operational lease differs from a financial lease, as the asset will not be on the balance sheet of the lessee. Moreover, with an operational lease, the lessor is also responsible for the operation and maintenance of the asset as well as financing it. The lessee pays the lessor periodically; these can be accounted for as operating expenses (Pacter, 2015). Both forms are existing arrangements, it was discussed that a collaboration with an external equity partner would be interesting, as well as developing ESCO-like constructions.

In cases mentioned during the interviews, neither the financial lease nor the operational lease convinced the customer to continue with the proposal. An argument voiced by the interviewees was that by offering such a solution, one eliminates the reason revealed by the company (lack of finance). Several conclusions can be drawn from this; the lack of finance was not the real reason for not continuing with the arrangement and other arguments are critical which were not shared with the supplier. Company culture is an aspect which should not be underestimated and one should bear in mind that the real motives are often concealed.

4.2.5 Own proposed solutions

As technology suppliers, these actors have field experience and can thus possibly identify what the market would need and what kind of solutions would be appropriate. This insight is of value, which is why the interviewees were asked what kind of solutions they would propose from their own point of view. Different answers were given, see figure 16.

Figure 16 Solutions from a personal perspective proposed by suppliers

As can be observed, varying answers were given and all input is taken into consideration. The input provided is used when preparing for the interviews with the end-users and of great value as it presents insight into possible effective solutions. ESCO constructions are not widely implemented yet in The Netherlands, but they show potential (Sijbrandij & Korbee, 2012). Multiple interviewees mentioned that an ESCO construction is an arrangement they would like to look into, and possibly propose as a solution in the near future. Although one supplier already offers an ESCO construction as a solution, not all interviewed companies are as advamced and thus it remains a suitable solution for this research.

Another idea raised was equipping the auditors, which perform the energy audit at companies, with more knowledge. Notably, knowledge on new energy efficient technologies that are on the market. This would aid in spreading awareness and lead to recommendations with more impact. It is believed that tax incentives and more industrial symbiosis would also be good stimulants to improve energy efficiency. Furthermore was a subsidy like the SDE+ was proposed, specifically for industrial energy efficiency projects. Some even mentioned more enforcement as this would push companies to implement more projects, which would positively affect the business of the technology suppliers. Lastly, a cultural aspect was voiced. The current mind-set of companies is set on payback periods of two to three years. It is a difficult market and for some technologies, this payback period is not achievable. During one of the interviews it was reasoned that companies should accept a longer payback period (5 years) as these projects are still economically interesting. This could significantly change the market and open up more opportunities.

4.3 Interim conclusion

Five technology suppliers are interviewed. They are perceived as a source of knowledge due to their hands-on experience. The technology suppliers and end-users operate in different markets, and as such experience different limitations. To maintain a successful business, it is assumed that technology suppliers have to be creative with selling their products. For this reason, it is decided to interview technology suppliers first before interviewing end-users. The main goal of these interviews is to gain insight in the complexity of the capital barrier and to investigate if they may have constructed creative solutions to survive in a dynamic market.

Two selling points are mainly used to sell their product which are a reduction in costs and that the customer is unburdened in such a way that it can focus on its core-process. Aside from two selling points, two main reasons why a customer declines the offer can also be observed. The company states that it has other priorities, or that it cannot accept the proposal due to financial reasons. It should however be noted that it is difficult to determine what the exact reason for the decline is as companies tend to conceal it.

Three solutions are opted by the technology supplier: rent-buy construction, ESCo construction and a financial/operational lease.

5. Data analysis II - End-users

A crucial part of this research is the interviews with the end-users. The devised financial instruments at the end of this research will be designed for this group. As such, are the results of these interviews of value and increase understanding regarding their needs and limitations. In the following text, the results of the interviews are presented.

5.1 Interview set-up

The information and insights gained during the interviews with the technology suppliers is used as preparation for the interview with the end-users. It is decided to interview companies that take part in the long-term agreements (MEE and MJA3). As they are responsible for 80% of the total industrial energy consumption and a quarter of the national consumption (Rijksdienst voor Ondernemend Nederland, 2014), measures introduced in this group can have impact on the national energy consumption on a short term (within 5 years). The end-users were approached via e-mail and contacted by phone. The sent mail, see appendix D, introduced the aim of the research and a call for participation. Compared to the mail sent to the technology suppliers, the mail to the end-users is concise and brief. This was deemed most effective to clearly convey the importance of this research and why companies should participate. The interviews were recorded for data analysis, fifteen out of sixteen companies agreed to the interview being recorded. A summary of the interviews can be found in appendix H.

Sixteen companies agreed to take part in the research. The companies can be divided in two groups, MJA3 and MEE companies. The main difference between the two categories is that MJA3 companies have to comply with the Dutch Environmental Protection Act (Wet Milieubeheer) which states that all projects with a payback period of less than five years have to be implemented. MEE companies are exempt from this regulation as they take part in the EU ETS regulation. In figure 17, the ratio between interviewed MEE and MJA3 companies can be observed. Apart from an additional question for MJA3 companies regarding the Dutch Environmental Protection Act, companies from both groups are treated equally and the interview questions remained the same.

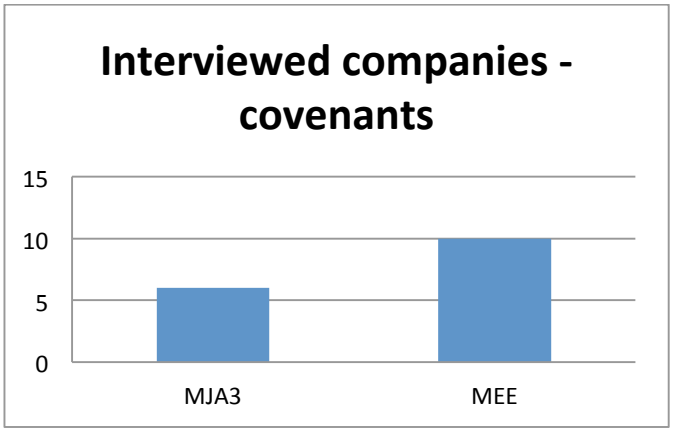


Figure 17 Interviewed companies categorized according to long-term agreements

The MJA3 and MEE covenants do not focus on one specific industry. The same applies to this research. As this research is an exploratory study, insights from various industries are valuable but increase complexity. In figure 18, it can be observed how the interviewed companies are divided according to their respective industries. Ahead of time it is difficult to predict which companies would agree to participate in this research. In figure 18, it can clearly be observed that half of the interviews with the end-users took place with chemical companies. This observation does not influence the research. Nonetheless, although eight chemical companies are interviewed, it remains challenging to make coherent statements based on obtained information for this industry as the chemical companies cannot be compared to each other.

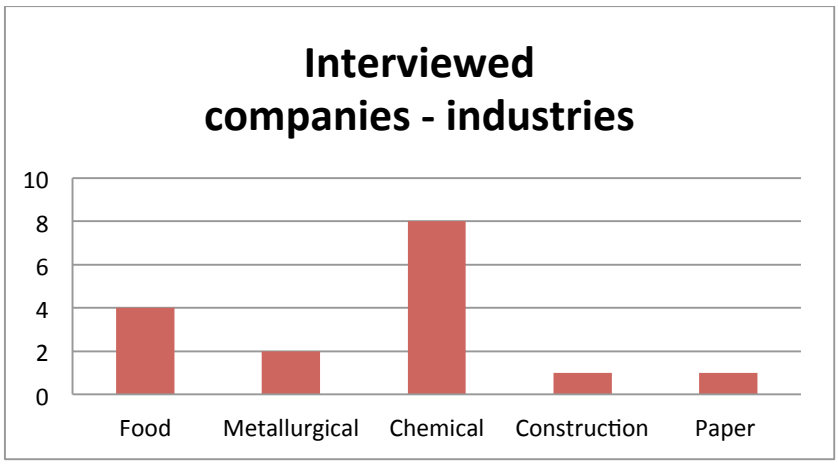


Figure 18 Interviewed companies (MJA3 + MEE) categorized according to industry

The interview was scheduled for 1.5hours and took place at the office of the company or at the office of FME. In the case of insufficient time and to lower the barrier for participation, some interviews were done by phone. The goal of these interviews was to explore the importance of energy efficiency in the company and to increase understanding as to why projects (with a payback period of 2-5 years) are not implemented. It also concentrates on what kind of solutions would help in stimulating energy efficiency in a way that more projects can be implemented.

5.2 Interview outcomes - questions

As this research is an exploratory study, the prepared interview questions served as a guideline for the interviews. Apart from the prepared questions, other subjects introduced by the interviewee were also taken into account and were discussed during the interviews. A considerable amount of information is obtained and in the following subchapters, the various subjects and questions presented are discussed.

5.2.1 Energy efficiency on a company level

As the interviewed companies are all participating in either the MEE or MJA3 covenant. This meaning that they should save 1.5-2% annually (as a sector) on energy to comply with the targets set by the covenants. This question is vital to comprehend how important energy efficiency is at the interviewed companies and how this affects business.

Driven by profits

As Milton Friedman stated, "the business of business is to increase its profits". Although it is wishful to believe otherwise, companies are driven by capital (Friedman, 1970a). From the sixteen interviewed companies, twelve of the sixteen companies are stock listed. This means that they have a responsibility to their shareholders to implement profitable projects. One company even stated that as they are stock listed, an IRR of minimally 40% for an investment project is required to be considered as a possible project to be implemented. A project with an IRR of 20% and a great impact on sustainability was opted, but not taken into consideration due to the strict demands concerning the IRR of a project. This finding raises concern as it shows that the investment strategy is not aligned with the national development towards a sustainable society.

One of the advantages of energy efficiency is that it results in a cost reduction. However, this is not mentioned as a driver to implement projects by all interviewed companies. This can be due to several reasons, a lack of knowledge (companies are not aware of the benefits) or companies have been unsuccessful to monetize energy efficiency benefits. It could also be the case that it may be challenging to justify towards your shareholders why certain projects are implemented whilst other projects may have a higher IRR. This consideration is delicate and requires more in depth knowledge on a company level to make justified statements.

Low hanging fruit

A reoccurring issue at many interviews was the statement that at many interviewed companies, the low hanging fruit has been plucked already. Low hanging fruit in this research is defined as measures where quick wins can be achieved with simple adjustments and a low degree of risk. Examples of low hanging fruit is the replacement of fluorescent lighting to LED, motion-sensored lighting, base metering operations and processes and increasing awareness on-site. Just as "sustainability", low hanging fruit is a concept with many meanings. The boundary conditions for what can be accounted as low hanging fruit differs per company, and even per person.

At companies where the low hanging fruit has been implemented already, it becomes increasingly difficult to reach the set annual targets and any additional energy efficiency can only be achieved by (radical) innovations and/or changes in the core-process. These changes are paired with high investment amounts and longer payback periods than accepted at the company. Especially for the interviewed companies that are stock listed, this seems to be the case. For small and medium companies (MKB-companies, 1-250 employees) this is however not the case and there appears to be low hanging fruit with high potential and relatively low investments (± 30.000 Euro).

No distinction has been made between large companies (+250 employees) and smaller companies (1-250 employees). However, in this research, mainly large companies (fifteen out of sixteen) positively replied to the call of participation which is why no exact statements can be made regarding the potential and low hanging fruit at smaller companies.

Parent company

From the sixteen interviewed companies, eight of the interviewed companies have parent companies outside of Europe. For some, this is considered as an obstacle and several reasons were given. Potential projects are evaluated by the parent company; the parent company also determines annual budgets. As the projects are passed to the parent company which are outside of Europe, one can imagine that a non-existent level playing field on various regulations play a role. For example, it may be determined to invest and produce in another country as it is much more economical (due to beneficial regulations or non-existent labour rights). Having a parent company outside of Europe could also affect the accounting standards the facility in The Netherlands has to adhere to. Most companies in Europe follow the IFRS accounting standards. However, with a parent company in North-America, US GAAP accounting standards are adopted which are more strict. This may restrict a company from implementing leases or off-balance financing schemes, influencing the project evaluation of the company.

One company stated that below an investment of 10 million Euros, the branch in The Netherlands is allowed to determine the allocation of resources themselves. Projects with an investment amount of above 10 million Euros have to be evaluated by the parent company in North-America. This may seem like a beneficial agreement, but in a period where low-hanging fruit projects have been implemented and substantial changes can only be realized by executing sizable projects, the parent company has to be frequently consulted. Another company also stated that by introducing creative financial constructions, the facility in The Netherlands may be able to bypass the parent company in Asia to evaluate a project. This may positively influence a project's success. In both cases, off-balance financing or a subordinated loan would be effective.

Value chain

One interim conclusion that can be drawn from the answers is that the location of the company in the overall supply chain affects the importance of sustainability. Companies that are close to the customer value sustainability and energy efficiency more than companies that are situated earlier in the chain. It is thought that this is due to social pressure and green branding. One company even stated that the power of consumers should not be underestimated and should be applied more effectively to realise more energy efficiency at the company level.

Nonetheless is sustainability and energy efficiency a topic that is gaining importance at companies. At some companies the push for sustainability originates from the management level (top-down). At other interviewed companies the interviewee is in the process of involving management to gain more attention for the subjects (bottom-up). In figure 19, it can be observed that nine companies out of sixteen only fulfil compliance. The set targets set are based on meeting the annual targets as required by the MJA3 or MEE covenant. For seven out of sixteen it is part of the company's strategy, in which case the targets are set higher than demanded by the MJA3 or MEE covenant. No conclusions can be drawn from the answers provided during this interview in determining which approach is more successful. More research can and should be done from a social point of view and the effects on sustainability and company strategy.

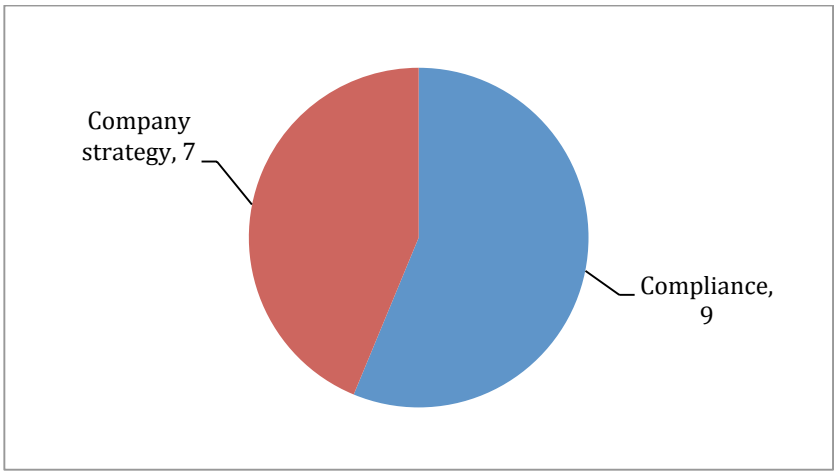


Figure 19 Drivers of energy efficiency

5.2.2. Investment categorization

When deciding which projects to implement, projects are ranked according to importance. How are projects categorized and are sustainability and energy efficiency subjects taken into account? This part of the interview is essential as it increases insight in how sustainability and energy efficiency is incorporated in the internal allocation of budget.

Compliance first

It must come as no surprise that must-do investments are ranked first. Must-do investments are investments a company should implement to comply with certain regulations or rules. These can be investments to ensure the safety and health of the employees, or environmental investments (e.g. to comply to emission standards, HSE investments) that are crucial to continue conducting business. Following compliance investments, replacement investments and strategic investments come second. Strategic investments in this research are defined as investments that are aimed at improving the strategic position of a company. For instance, a company could decide to enhance the position in a certain market. In this case it could allocate an investment, which aims to do so, as a strategic investment. The benefits of this are that, often, longer payback periods are accepted as well as high investment amounts. After must-do investments, replacement investments and strategic investments are projects which are ranked on payback period. Projects focused on energy efficiency can be found in this last category and have to compete with other projects. Companies also stated that when it comes to the last category, approximately 10-20% of the total investment budget is left.

On the bright side, a positive development can also be observed. Three out of sixteen companies mentioned that sustainability and/or energy efficiency is appreciated in the process of ranking projects. How this is done varies per company. One company stated that they have made a separate category for sustainability investments where longer payback periods are accepted. Where regular investments need to have a payback period of 2-3 years, sustainability projects are allowed to have a payback period of 6 years and sometimes even 8-10 years. This is exceptional and during the research, this company was the only one where this was introduced and where it was explicitly mentioned that longer payback periods are accepted for sustainability investments. The other two companies introduced an internal sustainability ranking process where projects are assessed based on sustainability categories such as energy efficiency and resource management. For example, if the company has to choose between two

projects with the same payback period but with different sustainability rankings, the project with the higher sustainability ranking is selected.

Of the three companies, two are close to the customer in the value chain. The amount of interviews conducted does not provide a solid base to justify that the position in the value chain has a connection to the manner investment projects are categorized. It is, nonetheless, an observation made during this research and perceived as a logical explanation as to why the focus on sustainability is more apparent than at other interviewed companies. The third company is ambitious. It is focused on obtaining a leadership position in terms of sustainability, believing that this way of conduct is the key to ensuring a future for the company. These findings are very positive developments and show that sustainability is becoming a deciding factor in determining which projects to implement. Sadly, as this is only the case at three out of sixteen companies, these situations are the exceptions and not business as usual scenarios. More research should be done in the effectiveness, the drivers and the social aspect of changing investment categorizations.

Restraints

As introduced earlier, some interviewed companies have strict guidelines on the accepted financial ratios for an investment project. At some companies a trend can be observed in terms of accepted financial ratios. During the interviews, it has been mentioned by several companies that a payback period of around 2-3 years is accepted. If a project has a payback period of longer than three years, it is often written off by the project owner before it is even suggested for implementation. The focus of this research are projects with a payback period of two to five years, it is agreed upon by all interviewees that this is a difficult category. The statements of the interviewees regarding the accepted payback period of 2-3 years confirm this chain of thought. The basis for these constraints is not mentioned during the interviews, but it is expected that this is due to the companies' responsibility towards its shareholders and a short term vision. Company restraints and strict guidelines are negatively influencing the implementation of projects with a payback period of two to five years and thus also influence how investments are categorized.

As introduced in chapter 2.1.2, the Dutch Environmental Protection Act states that all projects with a payback period of 5 years or less should be implemented. This is only applicable to companies participating in the MJA3 covenant. During the interviews with the MJA3 companies, they were asked if this measure had any effect in business as usual. The interviewed MJA3 companies are aware of the measure, but state that there is no enforcement. Only one out of six companies stated that due to this measure, projects with a payback period of five years or less are placed under the license-to-operate (must-do investments) category.

This observation, that companies have strict guidelines regarding short payback periods (2-3 years), is disappointing but understandable. It is disappointing as it shows that projects with potential (payback period of 2-5 years) are not taken into account and that it becomes more difficult to implement these projects. It is understandable from a company's point of view as it deals with uncertainties from operating in a dynamic market. Changing this strict guideline set by companies is challenging and may take governmental measures, such as the existing Dutch Environmental Protection Act for companies participating in the MJA3 covenant. However, for a governmental measure to be effective, enforcement should be in place which is abided to by

companies. Five out of six interviewed MJA3 companies disclose that there is no enforcement, this observation appeals for action and demonstrates the ineffectiveness of the 5 years payback rule in the Dutch Environmental Protection Act.

5.2.3 Potential projects

The assumption made in this research is that projects with a payback period of two to five years are not implemented. To prove this assumption, companies were asked if they could give examples of projects within this category that are put away in a drawer as they do not comply with the set guidelines for investment projects of the company.

Varying investments

On average, all companies proposed two projects that have a payback period of two to five years. In total 28 projects were shared of which 19 were presented with an expected investment amount. The amounts varied from 30,000 to 70 million Euros, in figure 20 the expected investment amounts are divided per category. It can be observed that projects of varying investments are present of which 9 out of 28 are below 5 million Euros.

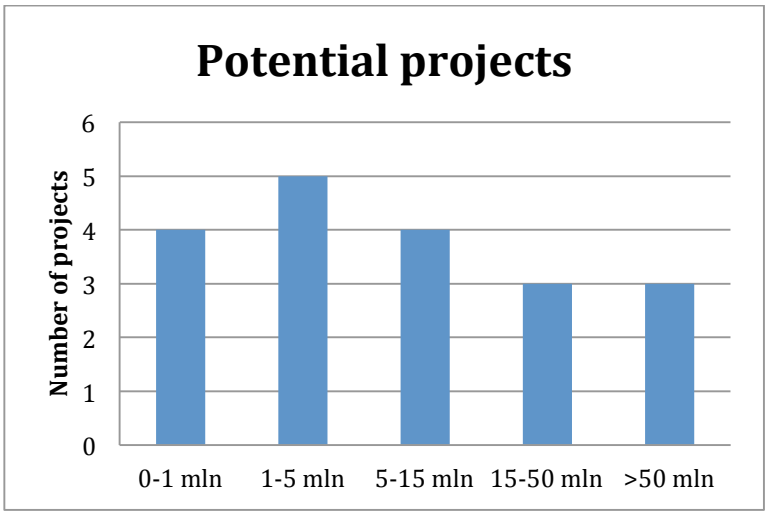


Figure 20 Potential projects organised per investment amount

Several reasons were mentioned as to why these projects are not implemented. The first reason is the payback period which is perceived as too long. As mentioned before, as many of the interviewed companies have a hurdle rate with the payback period being two to three years, a payback period of four to five years is not accepted. This trend was observed during the interviews with this hurdle rate being mentioned by multiple interviewees. Noteworthy is that some projects shared were low in technology risks. This meaning that the investments are either in utilities, thus the core-process is not affected, or that proven technologies would be used. For this research, this is a valuable observation because risk mitigation is of concern. If in the near future, external instruments are introduced and financers involved, it is reassuring that the risks introduced with the projects are low. This raises confidence and trust from a financial point of view that the investment is a safe bet. On the other hand, there were also projects that were not implemented due to the high amount of risks. This was the case for projects on radical innovations, changes in the core-process or projects on not yet proven technology (such as geothermal energy). These projects are in the category investments of above 50 million Euros. Two of the three projects in this category are related to the implementation of deep geothermal

energy (6-9km). Although these are mentioned as having a payback period of two to five years, this statement may be deceptive as deep geothermal energy has not been implemented yet and thus comes with uncertainties and risks.

Another argument raised was that there is no sense of urgency to implement the project. When given the choice to select a project to increase capacity or production, these projects are most likely to be selected over resource- or energy efficiency. Although a project in resource- or energy efficiency translates to a cost reduction, companies are inclined to choose expansion over efficiency. It is this sense of urgency that should be instigated to change the inclination in such a way that more projects with a payback period of two to five years will be implemented in the near future. Facilitating solutions to stimulate companies are of significance and will be discussed in chapter 6.

Lastly, the absence of budget was used as an argument why projects are not implemented. This is a challenging claim, as more in-depth knowledge of the company is required to understand this barrier. Although there may not be a budget to execute the project, ten out of sixteen companies stated that capital is not the main barrier (see figure 21). These ten companies are all stock listed and shared that they are able to lend money at economically interesting rates. For the remaining six companies, a lack of capital is observed as a reason as to why interesting projects are not implemented.

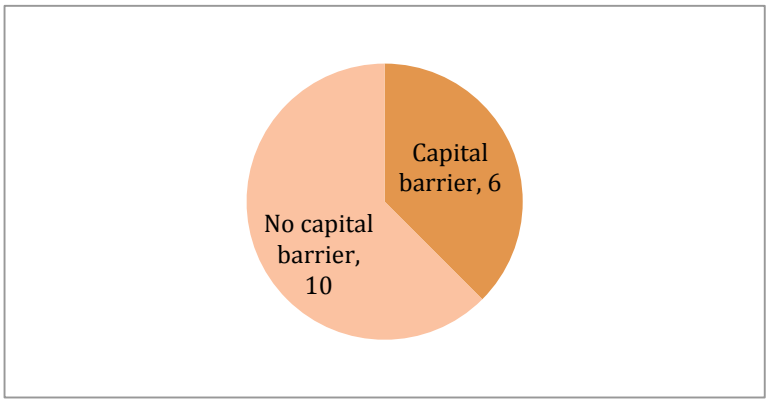


Figure 21 Division of companies on the capital barrier

Companies that are able to arrange loans at modest rates would rather not make use of an external third party financer as it would be more expensive than financing the project on their own. Another aspect, which increases complexity, is that companies do not prefer to take additional loans as this would negatively influence their balance sheets and financial position. Two out of sixteen companies even affirmed that their loans are maximized, meaning that the company is not allowed to take on additional loans. In-depth knowledge is necessary to understand what kind of instruments or measures would help; there is no one size fits all solution. The findings and observations are thought provoking as it challenges the literature on the capital barrier and its relation to energy efficiency.

Stacking benefits

Projects with payback periods calculated solely based on energy efficiency, and where an improvement of energy efficiency is the only reason the project should be implemented, are excluded from the list of potential projects. Energy efficiency is not perceived as the main driver and is nowadays the added benefit. Earlier, it was observed that drivers such as expansion or an increase in production is more valuable than resource- or energy efficiency. Stacking benefits is gaining ground, meaning that the amount of benefits of a project determines its likelihood of implementation. This however complicates the internal ranking of projects, making it difficult to categorize the projects due to the diverse benefits it brings. This is not necessarily a negative observation that limits the potential of energy efficiency. It indicates that companies are becoming more demanding and selective on which projects to implement and that energy efficiency, as the only argument, is not sufficient.

Energy prizes

A re-occurring case, it was also mentioned by the technology suppliers, is that the prices of energy are low. This negatively influences the payback period by prolonging them. Some interviewed companies argued that when the price of electricity was high (2008/2009), payback periods fall into the category of two to five years. However, with the current price of electricity, the payback period becomes longer than 5 years. This severely decreases the chances of implementation and introduces a new argument (uncertainty) as to why this category of two to five years is complex. In figure 22, the price development of four energy carriers is depicted. In the graph for electricity, it can be observed that the prices of electricity were rising from 2005 – 2009. From 2009 on, prices started to decline. It can be argued that the reason for this decline is the introduction of renewable energy sources, negatively influencing the electricity price. With an expected increase of the share of renewables in the energy mix, electricity prices remain unpredictable and may even continue to decrease. Aside from the electricity prices, the price developments of natural gas, coal and oil are also dynamic. These fluctuating prices of the major energy carriers increase uncertainty and can be recognized as one of the reasons that companies have a short-term vision.

This remark increases understanding as to why companies have a short-term vision. Due to the uncertainty surrounding fluctuating energy prices, and the unexpected drop of the price of electricity in 2010, companies are reluctant to look further than 3 years on average. Also, as can be observed in the price development of electricity, the price of electricity has been declining since 2010. It is challenging to predict if prices will decline even more, or will show a surprising rise. The price of electricity is not the only reason companies are cautious to look further than two to three years. Their short-term vision can also be explained by other reasons, such as the uncertainty of survival and an increasingly competitive market.

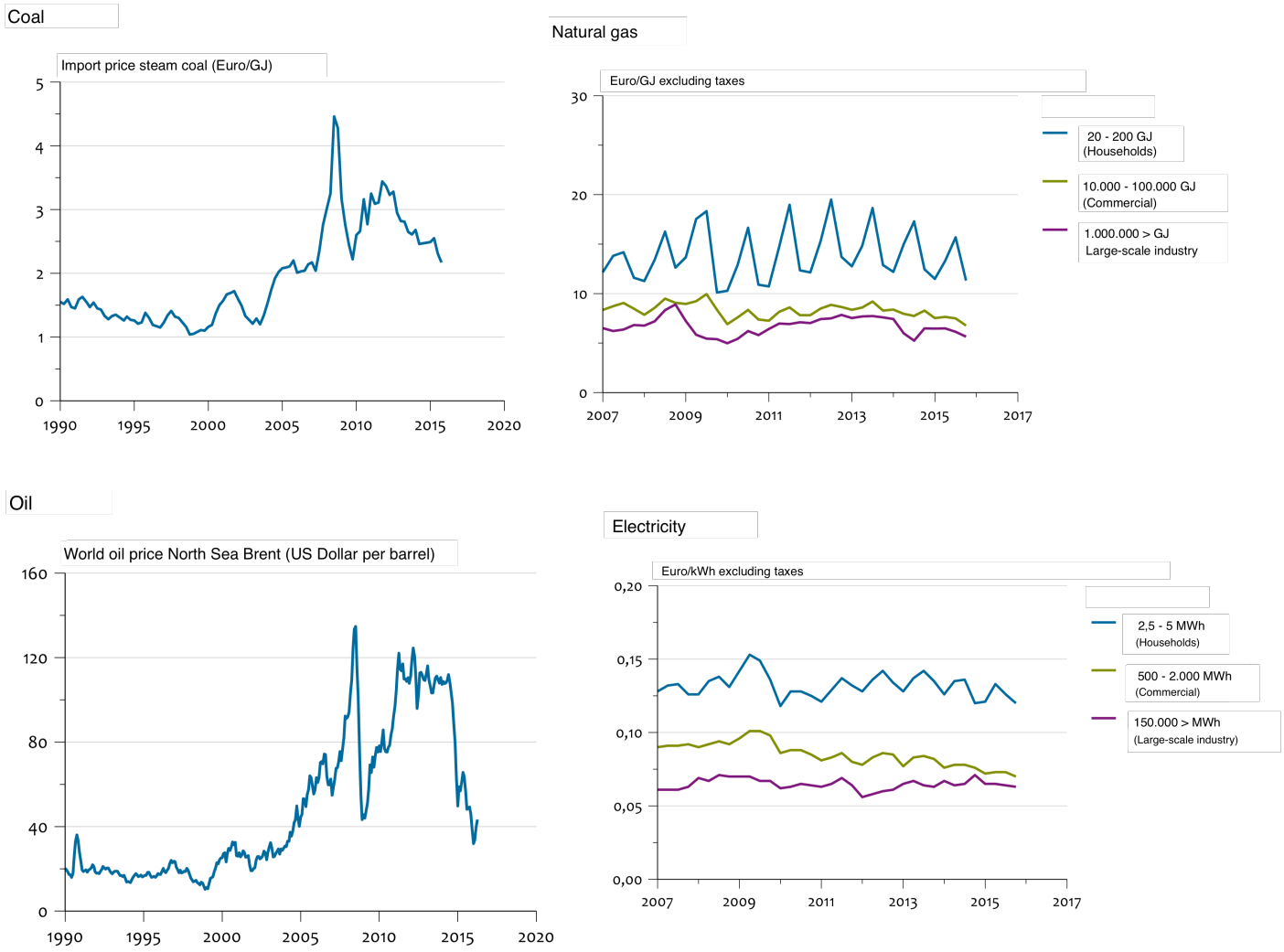


Figure 22 Development of prices of four major energy carriers *source:* (CBS, 2016)

5.2.4 Role of the government

An interesting element of the interview was the discussion on the role of the government and the industries' perception on how the government is fulfilling its tasks. There was a consensus amongst the interviewed companies that there is no enforcement. For example, the regulation in the Dutch Environmental Protection Act which states that all projects with a payback of 5 years or less should be implemented for companies taking part in the MJA3 covenant. The idea behind the regulation is comprehensible and valuable if imposed. However, with no efficient enforcement, companies do not feel compelled to impose themselves with this rule. Thus, effective and efficient enforcement should be reinstated in such a way that MJA3 companies feel obliged to implement projects with a payback period of 5 years or less.

For companies participating in the MEE covenant, no such rule exists as they have to comply with the EU ETS regulation. Their addition to this discussion was that knowledge is limited on all governmental levels and that the government, as a whole, is not appreciated as a decent knowledge partner.

In this research, three levels of government can be identified: municipality, executive level (RVO) and policy level (EZ). The interviewed companies are familiar with had the executive level, as RVO is the executor of the covenants and is in charge of allocating subsidies. Policy level was most of the time introduced in the interview when existing arrangements contradicted each other and conversations on a policy level were necessary to request a change of arrangements. With many different stakeholders on varying governmental levels, the process of change is a bureaucratic and long process. Apart from a lack of knowledge, the government, at all levels, could be more stimulating. Although the idea behind the arrangements is well intentioned, flexibility is just as important as the idea. This became apparent when some interviewed companies shared some examples of cases when subsidiary arrangements contradict each other. The example had to do with the SDE+ subsidy which is allocated for an agreed upon period. The interviewed company has set a clear goal, to be climate neutral in 2020. They receive subsidy for biogas. However, the subsidy is only received when the biogas is used for a cogeneration unit to generate electricity and heat. The input for the cogeneration unit is not only biogas, but also natural gas. To be climate neutral in 2020, the company wishes to use the biogas for a boiler. If the company chooses to use the biogas for the boiler, it will lose its subsidy. The company therefore has two choices; accept that the subsidy will cancelled or try to transfer the subsidy so that it becomes applicable for using the biogas on the boiler. Approaching the problem with the executors (RVO) is not effective as they only implement and execute, the designated level for this request of change had to be taken up to the policy level. At the time of the interview, the company was in the course of discussions with Economic Affairs regarding this complication.

There is a myriad of subsidies and arrangements based on well-intended concepts and ideas. However, with many different instruments for different purposes, the focus and the overall goal may be lost. Flexibility in this case is key to find a suitable arrangement for every case. With companies and industries operating in different markets and in different conditions, universal arrangements applicable to all companies are not realistic. Custom-made instruments are needed, and so are custom-made arrangements to make existing subsidies more effective. As mentioned before, there is no one-size solution and we should not lose focus of reaching the goals set by the government (14% renewable energy by 2020, 16% by 2023).

Fortunately, a positive sound was also shared during the interviews. Two out of sixteen companies indicated that they notice that the government, especially on policy level, is waking up and is starting to realise that the industry can help in reaching national goals. Furthermore, two other companies out of sixteen indicated that at the time of the interview they were in discussion with Economic Affairs regarding hindering subsidies or discussing research into innovative technologies (e.g. geothermal energy). These are positive developments and valuable observations. This, however, works two ways and companies should also realise that they have something to offer. It is a win-win situation where the industry is a suitable partner to realise sustainability goals. By increasing understanding, thus also increasing knowledge, the industry and the government (policy level) should welcome conversation and find the golden mean.

5.2.5 Social aspect

An element of the conversation, which is not specifically included in this research, is the social aspect of energy efficiency and its effect. Although it is not the focus of this research, it can be identified as an underestimated element based on the interviews. The social element can be recognized in varying discussions, these will be introduced in the following text.

Industrial symbiosis

Apart from improving energy efficiency solely on a company level, interviewees also shared that there is potential in clustering industries to improve the usage of various streams (e.g. energy and waste). More research in connecting streams and companies is encouraged; there should be more industrial symbiosis. Industrial symbiosis is the concept of optimizing the use of (waste) streams. For example, a residual heat stream of one company could be utilized by a neighbouring company for other purposes. One's waste could be another's feed. Although the idea behind industrial symbiosis sounds romantic, it is challenging to establish. A very important element of industrial symbiosis is the social aspect, and in particular the element of trust. Establishing a link of resources is combined with sharing (possibly sensitive) information. The greater goal should be kept in mind when arranging such a construction, this may be easier said than done. Sensitive information is involved, thus the inclusion of a suitable neutral partner is recommended to bring relevant stakeholders together. By introducing a neutral partner that takes the lead, links between industries may be easier to establish going beyond individual interest and drivers.

As an example, one of the interviewees is part of an industrial cluster. When asked about the benefits, the interviewee reacted very positive. The industrial cluster has established many synergies between companies increasing efficiency. Nonetheless participating in such a cluster increases complexity, as you have to take into account more stakeholders, and it increases vulnerability, as processes are linked and companies are dependent on each other.
More research should be done to map the various streams and investigate the potential of linking companies in such a way to create more industrial symbiosis. As can be read in the article of Frank Boons on self-organization and sustainability, the industrial cluster in the harbour of Rotterdam was established by creating a platform where every company is equal and knows and supports the common goal. Numerable national stakeholder actively took part in this process, such as the ministry of Economic Affairs (EZ), the National Industry Association, the Environment & Spatial Planning (VROM) and regional and local authorities (Boons, 2008). The example and the situation sketched in the article shows that the addition of a neutral, overviewing partner can positively affect the conversations. Also, as all companies agree to put themselves in a vulnerable position, this positively affects self-organization increasing institutional capacity.

Industry as partner

In chapter 5.2.4 it was briefly introduced, the industry can position itself as a partner to reach set sustainability goals. During the interviews it was mentioned multiple times that the public and political perception of "industry" is more often negative than positive. This results in the industry taking a defensive stance, whilst it has much to offer. Apart from a negative perception, a lack of knowledge at the three governmental levels and a knowledge barrier also influences the industry's defensive stance. The government is not perceived as an equal and knowledgeable

partner in conversations. However, in neighbouring countries this is not the case and governmental bodies are more knowledgeable. Three out of sixteen interviewed companies shared this observation during the interview and said that this is a distinct difference between the government in The Netherlands and the government in Belgium or Germany. Although the Netherlands has much knowledge and expertise, it can be derived from the interviews that this expertise is mainly situated in the industry and barely on the governmental levels.

To establish close collaborations between companies and the government, there should be more conversations to share knowledge and increase understanding. With collaboration meaning, finding and devising tailored solutions to implement projects where both parties are in a win-win situation. By implementing projects with great (climate) benefits the industry becomes more sustainable and the government is able to reach its set goals faster. To do this, leadership is needed. This was also observed during the interviews. It helps to have a visionary on the team to lead the way by exhibiting passion and enthusiasm. As an example, only one out of sixteen interviewed companies stated that it accepts longer payback periods for sustainability investments (6-8 years is accepted). This push for sustainability and the acceptance of longer payback periods originates from the management level. This is a very welcoming observation and shows the importance of leadership.

To create such win-win situations, two important elements are needed: successful projects to be used as examples and leadership to lead the way towards more collaboration between government and industry. This leadership comes with social skills and the ability to explain a project or problem in such a way that the government (on policy level) understands the benefits the proposed project could bring. It was observed during the interviews that companies often initiate a conversation with the government (policy level) when existing subsidies or instruments are hindering. Minor adjustments to create tailored solutions could be the deciding factor for a company to implement a project with potential, resulting in the company and government being able to fulfil their goals. Leadership is also needed to demonstrate that instead of taking a defensive stance, it is more valuable to take on an active stance. The industry should be positioned as a partner in fulfilling set sustainability goals and leadership is needed to convince and show companies that this is possible.

> *"The world needs leaders made strong by vision, sustained by ethics, and revealed by political courage that looks beyond the next election. It needs leadership that is proactive, not simply reactive, that is inspired, not simply functional, that looks to the longer term and future generations for whom the present is held in trust."*
>
> (Commission on Global Governance, 1995)

In Our Global Neighbourhood, a report written by the Commission on Global Governance, the significance of leadership is underlined. This quote illustrates the importance and the qualities needed, it should moreover be present at both parties. It can be concluded, from the many observations made during the analysis of the interviews, that a positive development can be detected where the government is becoming more aware of the industry's position and their potential to help in reaching national sustainability goals.

5.2.6 Relevant discussions

As the interview is semi-structured, there is room for introduction of additional subjects that are related to energy efficiency. Several topics were brought up during the interviews, the three most relevant are introduced in the following text.

Heat network

A discussion often introduced during interviews is the availability of waste heat and the potential of a heat network. Four out of sixteen companies specifically mentioned a heat network in varying cases. It was mentioned in relation to industrial symbiosis and in relation to establishing a heat network where residential environments are heated by utilizing industrial waste heat. It was even specifically mentioned by one company that it has waste heat of 60-80°C that is, at this moment, being disposed of. Instead, this waste heat could easily be used for district heating purposes. In figure 23 it can be observed what the heat demand is for different sectors including the desired temperature. The residential sectors have a demand of approximately 350 PJ of heat of below 100°C. With the industry addressing that waste heat of 60-80°C is currently disposed of, it is regrettable that this heat is not used for other purposes.

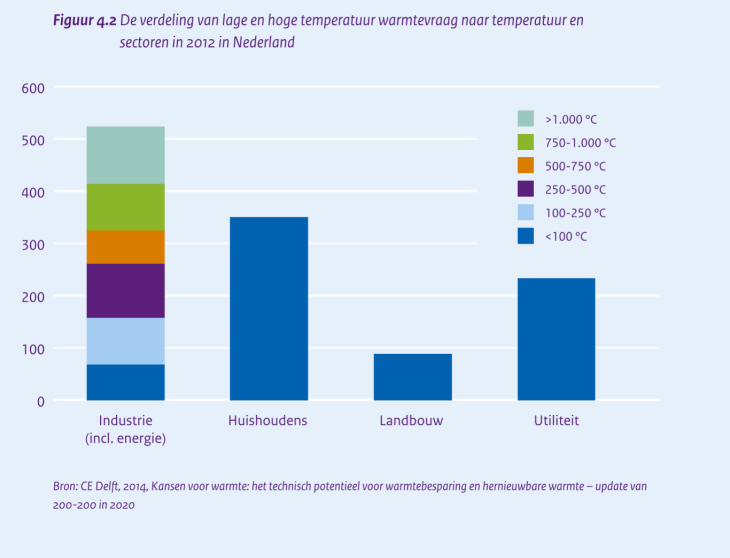


Figure 23 Distribution of heat demand (in PJ) and temperatures for four sectors (2012)
source: (Ministerie van Economische Zaken, 2016)

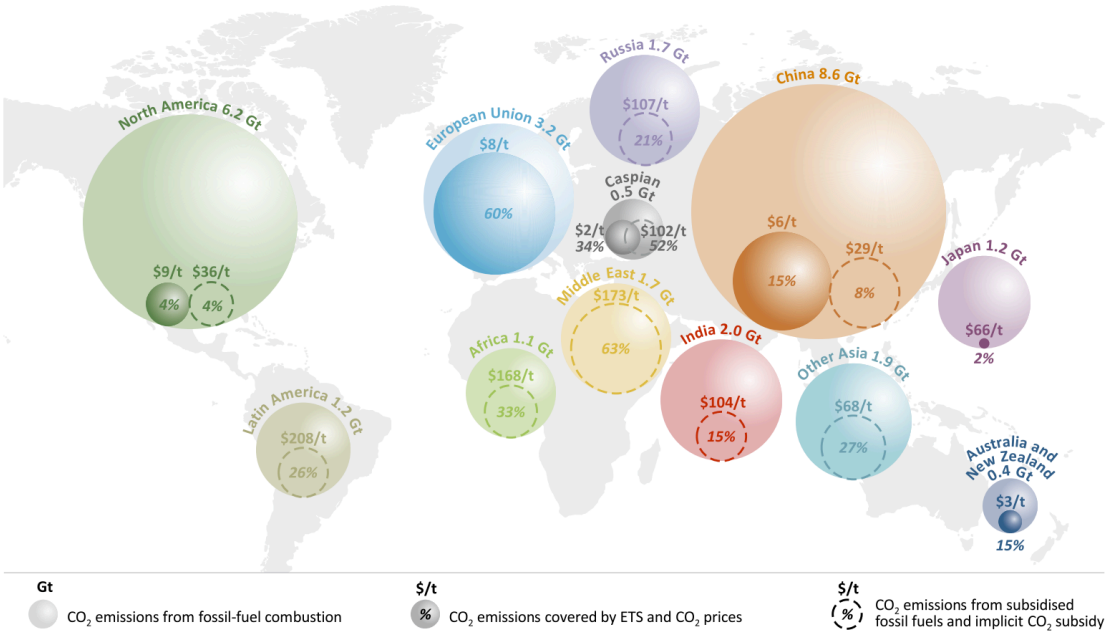
A critical barrier mentioned by the interviewees withholding the introduction of heat network is the required infrastructure. Companies are not willing to invest in the infrastructure at their own expense. One can wonder, is this even their responsibility? For the infrastructure of electricity, energy companies are held accountable. Waste heat for the residential environment is also a form of energy, should energy companies be responsible for this infrastructure as well? Based on the notions shared during the interviews, it is safe to say that opinions differ on this matter. Although viewpoints vary, more research on the potential of heat networks is valuable.

Level playing field and CO2 pricing

The importance of a level playing field was brought up several times in different settings. These varied from regulations across borders and across continents which negatively influences doing business in Europe. The level playing field discussion has different facets, from a company not investing in Europe as it is cheaper on another continent to differing safety and health

regulations. Many interviewees also shared the opinion that for the success of climate initiatives, it is important that the boundary conditions are equal in every country to prevent distorting and destabilizing situations.

An example of such a climate initiative is CO_2 pricing as an instrument to fight climate change. Next to the suggestion of increasing energy prices, various interviewed companies suggested the potential of pricing as an instrument and an incentive. It is expected that such an instrument will have an effect on investment decisions and will possibly result in more project being implemented. However, this observation was accompanied by a sharp remark; for the success of CO_2 pricing, it would be the most effective if every country abided to universal regulations creating a level playing field. This is easier said than done, figure 24 illustrates the varying prices for a tonne of CO_2 in parts and countries of the world. Aside from the EU-ETS regulation which works on a "cap and trade"-principle (European Commission, 2016b), there is no singular effective instrument to decrease CO_2 emission in a short period of time (before 2025) that is applicable to all countries across the globe (International Energy Agency, 2015a). Although the EU-ETS is the most encompassing CO_2 arrangement, compared to other existing agreements in the field of CO_2, it is dealing with an enormous surplus of allowances. This negatively influences prices and does not have any effect on companies' investment decisions (International Energy Agency, 2015a).



Notes: The implicit CO_2 subsidy is calculated as the ratio of the economic value of those subsidies to the CO_2 emissions released from subsidised energy consumption. ETS = emissions trading scheme.

Figure 24 CO2 pricing in various regions (2014) ***source:*** (International Energy Agency, 2015a)

The potential of a heat network, the importance of a level playing field and the introduction of a global CO_2 instrument are relevant matters to this research. It proves that the path towards a global sustainable environment is challenging and dynamic. Mechanisms and the subjects can be perceived as separate objects, but are in bird's view connected to each other. As an example, an effective CO_2 price can positively affect investment decisions. This may result in a change of boundary conditions to which an investment has to comply with (for example a longer accepted

payback period), thus in more projects being implemented and eventually an improvement in energy efficiency. Markets and dynamics are expected to change, it is therefore very difficult to predict how these matters and its dynamics will develop over time. Nonetheless does it show that much is still unknown and more research on these matters from different points of view is imperative.

5.3 Interview outcomes – financial elements

A crucial part of the research is the ranking of several financial elements of a financial instrument. The interviewee is asked to rank the elements on a scale of 1 to 5, with 1 being not important and 5 being very important, based upon if the element has an effect on the investment decision. With the results it is expected that a pattern can be found as to which financial elements are of importance to be able to implement more projects. The results of this list are moreover also used for the follow-up survey composed of financial instruments which are sent to the interviewees at a later stage. This survey will be discussed in chapter 6. Four out of sixteen companies did not fill in the list with financial elements. This was deemed unnecessary as during the interview, it became clear that these four companies do not experience a capital barrier and filling in the list would not provide any additional insights. The results obtained during the second part of the interviews will be discussed in the following text.

5.3.1 Internal / external financing

Before the list with financial elements was handed over, the interviewees were asked if there is a preference for making use of internal or external capital to finance projects. Twelve out of sixteen companies preferred internal capital, two reasons were given; the company can lend capital at favourable rates or it has reached its loaning capacity at which point it has no other choice than to use internal capital. Three out of sixteen answered that both are accepted, if the internal budget allows it then there is a preference for internal capital. If this is not the case, then external financing instruments are considered. The external financing instrument should abide to a strict requirement; it should be off-balance to prevent it from influencing financial ratios. Only one interviewee out of sixteen specifically mentioned that it has a preference for external capital as it has a deficiency of budget to implement more projects. The division of preferences can be observed in figure 25.

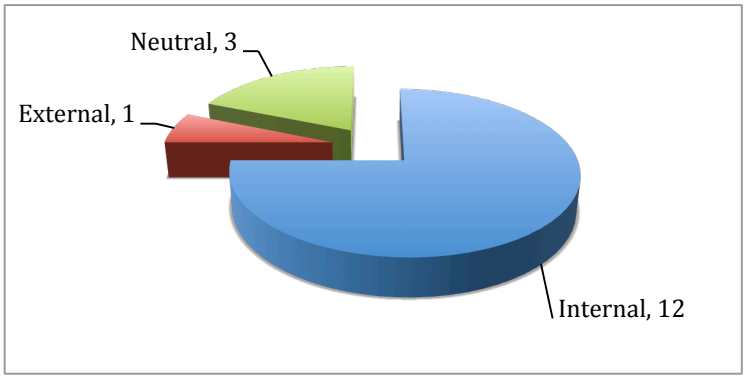


Figure 25 Preference for internal or external capital

Following from the preference for internal or external financing and the reasons mentioned, another observation can be made. As mentioned in chapter 1.4, a lack of capital is one of the six reasons voiced as to why there is an energy efficiency gap and in chapter 5.2 the observations made during the interviews are discussed. Although more than half of the interviewed companies are not limited, due to a lack of capital, does this not implicate that there is no need for (new) financial instruments. By facilitating attractive financial instruments, more interesting projects may be executed which are now put on hold. It may create an incentive and encourage companies to adjust the strategy on which investment decisions are momentarily based on.

5.3.2 On-balance / Off-balance

The discussion whether a financial instrument should be on- or off-balance and to what extent this is a deciding factor in an investment decision is illustrated in figure 26 and 27. In figure 26 it can be observed that for six out of twelve, it does not have an effect on the investment decision if the instrument is on- or off-balance. For five of them, it is a deciding factor and when given the choice between on- or off-balance, these companies prefer off-balance instruments.

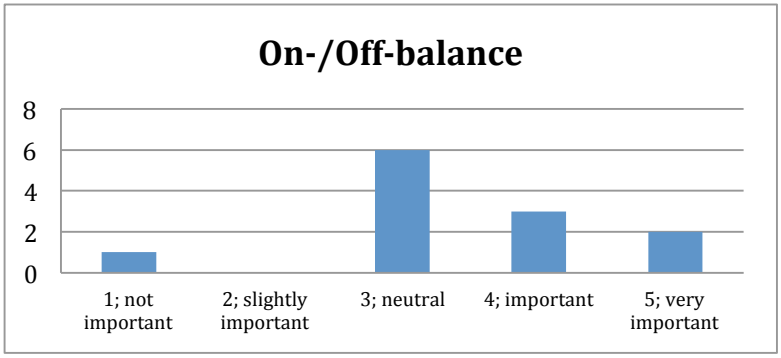


Figure 26 Result of the list of financial elements: on- or off-balance

In total thirteen out of sixteen companies were asked if they preferred on- or off-balance financing. The answers provided can be observed in figure 26. Although more than half of the companies prefer off-balance financing, it is mentioned that this is difficult to establish because of several reasons. Reasons such as strict accounting standards play a role as well as ownership of the equipment and risk division.

Although the greatest part of the interviewed companies prefers off-balance financing, it is expected that establishing an off-balance mechanism will be more difficult in the near future. In August 2010, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) published a proposal of change for the accounting rules concerning lease arrangements (Van Hal & Tahtah, 2010) which will be effective from the 1st of January 2019 on (Piersma, 2016a). The most relevant change for companies being that all lease arrangements have to be included on the financial balance sheets. In chapter 2.3.3, the financial and operational leases are introduced. An operational lease can be off-balance, whilst a financial lease is an on-balance mechanism. With the proposal for change, both leases will have to be included on the financial balance sheet. This will have a negative effect on companies increasing debt and lowering solvency (Piersma, 2016b). The idea behind the adjustment of the rules is that companies can more easily be compared to one another and that a realistic financial image of a company is portrayed. A news article in a Dutch newspaper (Het Financieele Dagblad, dated

13th of January 2016) states that of the 3000 billion Euro worth of lease contracts from stocklisted companies, approximately 85% of these are off-balance. If by 2019 these off-balance arrangements are to become on-balance, this will severely influence the debt ratio and solvency of the company (Piersma, 2016b).

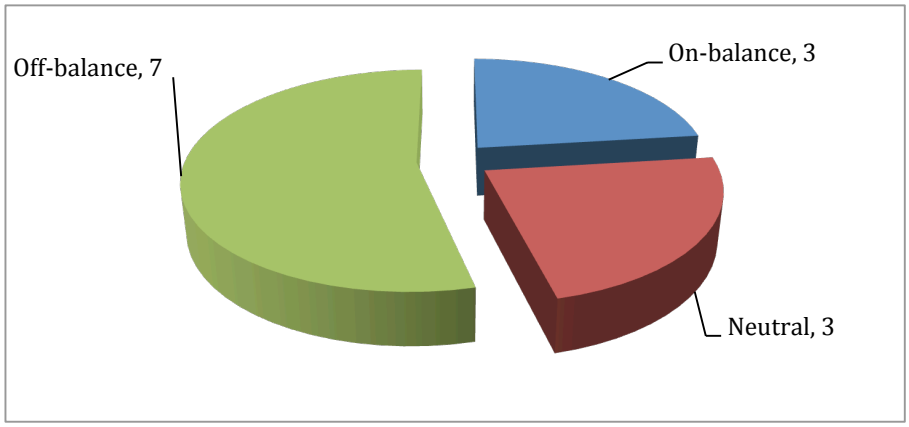


Figure 27 Preferences: on- or off-balance

5.3.3 Security

In some cases the financing party or the equipment providing party may ask for a security. For example, a heat pump is installed on location that is financed by an external party. The external party may ask for security in case agreements are not met such as if the accepting party is not able to pay back the investment. In this case, the providing party is authorized to remove the equipment. The concept of a security, in this research, is to lower the amount of uncertainty for the providing party. In figure 28 the rankings provided can be observed.

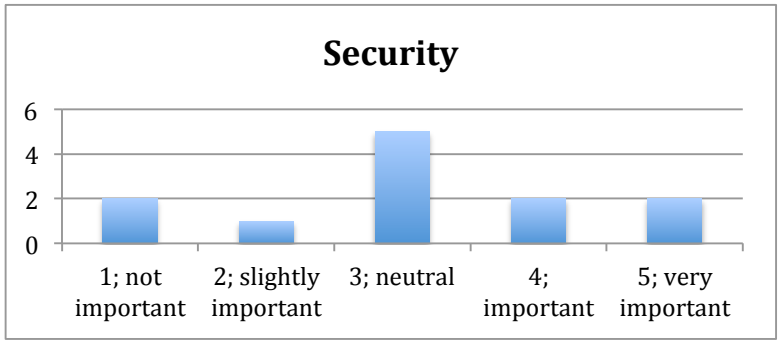


Figure 28 Result of the list of financial elements: security

The answers are dispersed, with many taking a neutral position. The overall opinion for answering 1,2 or 3 is because it is unlikely such a situation will occur and some are not reluctant to provide a security when asked for. Interviewees answering 4 or 5 were apprehensive for when the equipment would be removed from the process. Should such a situation occur, this might negatively affect business as the process will be influenced. Overall, it can be concluded that the security aspect in a financial instrument is not a deciding factor. As the interviewees

that answered 1,2 or 3 are not essentially not affected by this element, it is an aspect which can easily be included when devising new financial instruments.

5.3.4 Guarantees

The thought behind this element is for example a government guarantee where the company receives a guarantee to cover the inevitable and/or unpredictable losses. For instance, a company wants to implement a project in which heat is recovered that can be used to generate electricity. The project comes with much uncertainty due to unpredictable electricity prices. This uncertainty affects the capital budgeting method used, as it is uncertain which values should be used, and results in the company being reluctant to undertake the risk. It is opted that in this case, a guarantee to cover the inevitable losses when electricity prices reach a certain bottom line could be the deciding factor to implement the project. It is expected that even though the payback period may be longer than is deemed acceptable by the company, a provided guarantee could be the push needed to get the project executed. The result can be observed in figure 29.

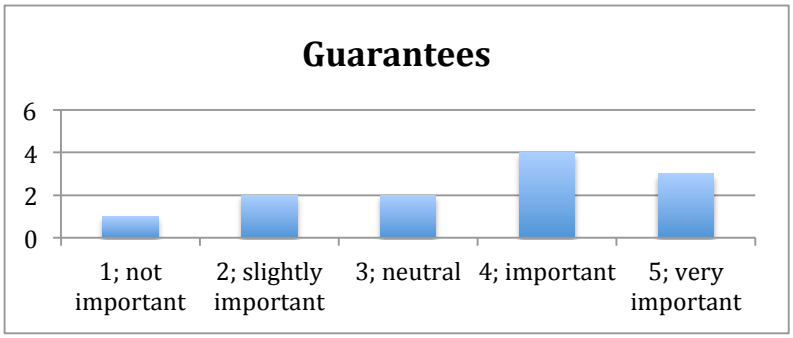


Figure 29 Result of the list of financial elements: guarantees

5.3.5 Duration of the contract

Every agreement or loan is coupled with a contract period. From the answers provided during the interviews it can be concluded that the length of the contract is important, it is an element which is taken into account when making an investment decision with a preference for short-term contracts. Only two out of twelve interviewees ranked this element as not important, two reasons were mentioned: one company labelled this element as not important as it is valued case by case, the other stated that it makes use of internal financing and thus does not deal with contract durations with external parties.

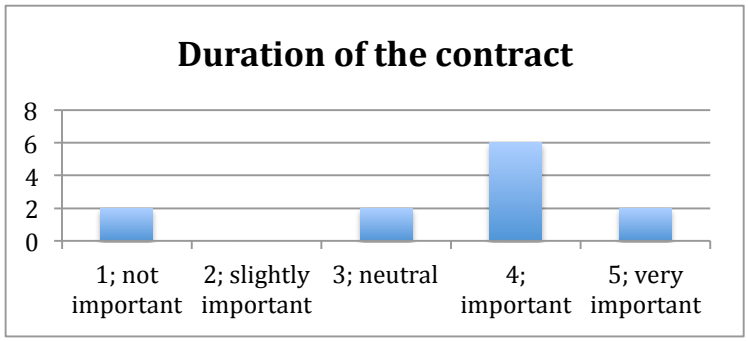


Figure 30 Result of the list of financial elements: duration of the contract

In figure 30 it can also be observed that half of the interviewees ranked this element as important, with two companies even ranking it very important. All of them suggested that the contract period should be coupled to the payback period of the project. This is reasonable and the result of this element clearly shows that the duration of the contract is of importance to companies. Although it may sound logical to couple the duration of the contract to the length of the project, it also introduces a complex matter. If this suggestion is included in the additional financial instruments, which will be introduced on a later stage, it means that the instruments will have to be customized to the project. This increases complexity as expertise will be needed and projects are to be valued case by case. Nonetheless, this observation exhibits the importance of the duration of the contract and the industries' view on the matter.

5.3.6 Interest and risk premium

The interest and the risk premium were for many interviewees difficult to answer. This was expected as the financial instrument is valued as a package deal with the interest and risk premium being dependent on different factors. For example, if a financing party decides to invest in a risky project, it may ask for a risk premium. Advantages and disadvantages are weighed against each other to decide if the use of external financing is worth the benefits. The height of the risk premium differs case by case and depends on the amount of risk that comes with the project.

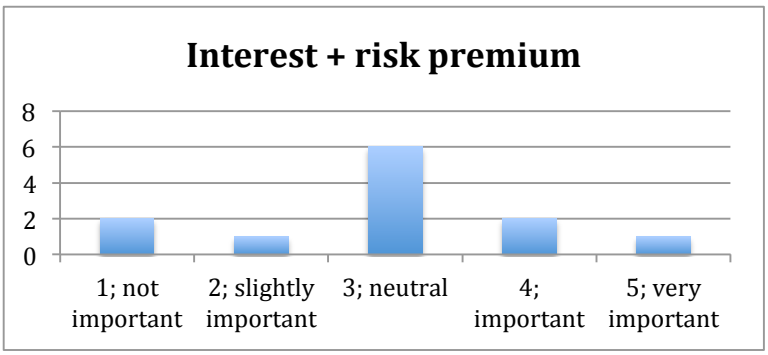


Figure 31 Result of the list of financial elements: interest and risk premium

In figure 31 it can be observed that the answers are very dispersed. Half of the interviewees ranked this element as neutral and when taken into account the division of the other answers, it can be arbitrated that the interest and risk premium are valued in relation to the other elements. When asked for an accepted interest rate, interviewees answered that the interest rate demanded should at least be market conform (based on interest rates as estimated by Euribor). In the case of the risk premium, interviewees answered that they understand why it would be asked of them. It was however suggested by one company, which ranked this element as neutral, that it longs for stability and thus desires a consistent interest rate for the duration of the contract. This element will not be taken into account to a great extent when preparing the list of financial instruments for the survey. This is because half of the interviewees ranked the element as neutral and the rest of the answers do not portray a preference. It is also an element that is dependent on other factors. This dependency increases complexity and determines its weight in the investment decision.

5.3.7 Performance guarantee

Performance guarantee can be understood as increasing certainty and lowering risk. A performance guarantee can take multiple forms, but is aimed at securing a certain amount of saving or a form of energy (steam/water/electricity) per agreed time period. The thought behind a performance guarantee is that the receiving company is ensured of a constant stream, decreasing the risk of the business being negatively influenced. It can take on the form of an ESCo providing a performance guarantee that it will save a certain amount per time period. Or in another setting, a providing company which is responsible for providing steam. For the receiving company, steam is needed for the process. A performance guarantee, which ensures that a certain amount of steam is received, decreases the chances of the business being influenced and the receiving company is able to focus more on its core-business. Especially in the utility sphere, these kinds of constructions (e.g. ESCO, operational lease) show potential.

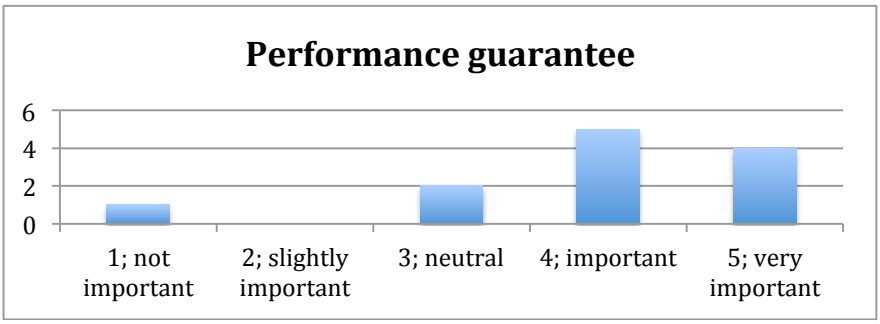


Figure 32 Result of the list of financial elements: performance guarantee

Figure 32 shows how the interviewed companies ranked performance guarantee. As can be observed, nine out of twelve interviewees indicated that this element is important to being very important. The overall reason for this classification is that the interviewed companies want security that the process will not be negatively influenced and that the providing company continues to perform as agreed upon. The majority of the interviewees labelled this element as being important to very important, but also mentioned a critical remark. Although the providing company ensures a certain amount, and is penalized if it does not deliver, it could occur that it is not able to provide as promised. In the worst-case scenario, the process is stopped and the receiving company is not able to continue its business. In this case, losses may be substantial to a degree that the providing company is not able to compensate this loss. In conclusion: although a performance guarantee is desired to make sure the providing company performs and delivers, the chance remains that a process may be negatively influenced.

Only one out of twelve interviewees answered this element as being not important. This answer was provided from the point of view that this company itself does not provide performance guarantees to other companies. The reason being that the chance exists that the company may be out of order for half a year due to an accident, in which case it is not able to perform and deliver as promised. However, with nine out of twelve labelling this element with a 4 or 5, it can be concluded that this financial element is important for risk mitigation and should be taken into account when proposing (new) financial instruments.

5.3.8 Sharing savings

This financial element is included in this list aimed at ESCO constructions. One of the facets of an ESCO construction is that the ESCO can benefit if it obtains a higher percentage of savings than agreed upon. As the ESCO benefits from additional savings, this element may act as an incentive to perform better and save more. The additional savings are shared between the ESCO and the receiving company, with the ESCO receiving more than the receiving company. This translates to an extra cost benefit for the receiving company and extra income for the ESCO. In figure 33, it can be observed that the answers of the interviewees are very diverse.

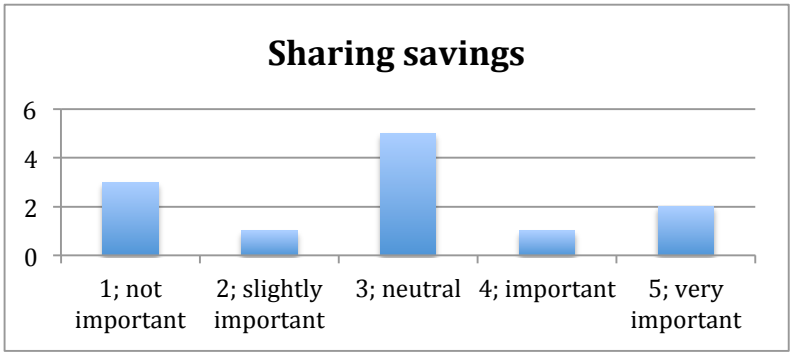


Figure 33 Result of the list of financial elements: sharing savings

Interviewees labelling this element as not important or slightly important indicated that it is not a decisive factor, it is a win-win situation and a suitable incentive aimed at the long-term perspective. One interviewee out of three ranking this element very important mentioned that it is understandable, but that it aims to share as least as possible. With the majority of the interviewees listing this element as neutral and with four out of twelve answering 1 or 2, it can be deduced that this element is not a decisive factor in the decision making process.

5.3.9 Fluctuating payments

To understand if fluctuating payments would be a differentiating element in financial instruments, it is included in this list. In figure 34, the answers provided by the interviewees are depicted. It can be observed that the amount of interviewees answering 1 or 2 are equally as much as interviewees answering 4 or 5. Fluctuating payments can be beneficial in several cases, when there is a seasonal production or the ability to pay or pay more when the company has had a successful period.

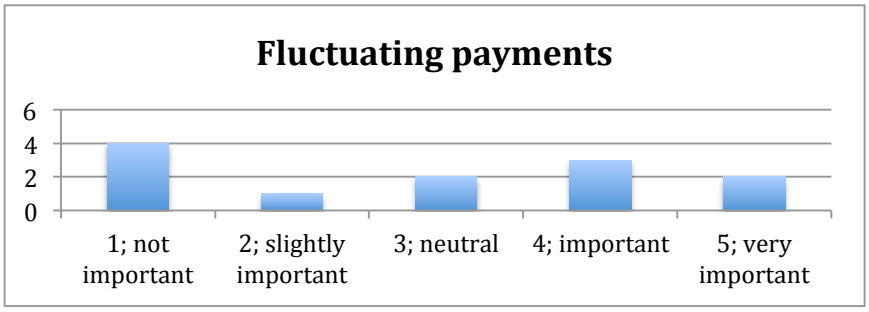


Figure 34 Result of the list of financial elements: fluctuating payments

The interviewees ranking this element as not or slightly important indicate that their operation is continuous or that they prefer a constant payment schedule. Interviewees indicating that this is important or very important mention that this would be interesting. One out of twelve companies had a seasonal production, meaning that the production process is operational in the winter and less in the summer. Other interviewees indicated that it would be worthwhile to link the payment schedule to the results of the project and that it would be an interesting aspect in the case of good and bad operating years.
Overall it can be deduced that it is not a decisive element, but that it would be beneficial in some situations. This element would need a case-by-case approach and could be an added benefit to customized solutions.

5.3.10 Subsidies

To start of, it must be clarified that subsidies should not be perceived as an element of a financial instrument. Subsidies are financial instruments, but are included in this list to find out if it is a decisive factor when making an investment decision. The ranking of this element brought up interesting comments and points of views. In figure 35, it can be observed that subsidies are without a doubt a decisive element.

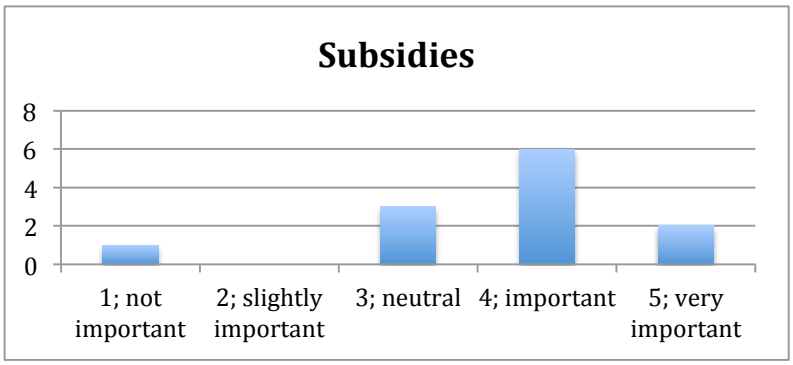


Figure 35 Result of the list of financial elements: subsidies

The majority of the interviewees ranked this element as being important to very important. It was shared that a capital expenditure subsidy would help to lower investment costs and thus shortening the payback period. Interviewees mentioned that subsidies should be used as an incentive and as a push to convince the decision makers in implementing the project. However, although being a decisive factor, it is often not taken into account when making a decision as the subsidy is coupled with uncertainty. At the moment of decision-making, it is uncertain if the subsidy will be allocated which is why investment projects are often calculated without taking into account subsidies. Only one out of twelve companies ranked this element as not important with the remark that subsidies are an unreliable instrument of the Dutch government as the rules and conditions of subsidies are constantly changing.

An interesting point highlighted by several interviewees is the model of the SDE+ subsidy for renewable energy. The SDE+ subsidy differs from other subsidies as it is on a contract base for a long period (10-12 years). It is a guaranteed subsidy for a certain period, introducing a constant element around which you can organize the capital for the investment project. The same model can be applied for industrial energy efficiency. All interviewed parties reacted very positive to this concept.

In conclusion, it can be said summarized that subsidies could make a difference for companies and may result in more projects being implemented. However, more research should be done to investigate how consistency can be introduced to this instrument and if a SDE+ subsidy model can be applied to stimulate industrial energy efficiency.

5.3.11 Fiscal incentives

As for fiscal incentives, the same reasoning used for subsidies can be said for the inclusion of fiscal incentives on the list of elements. Its effectiveness is questioned by investigating if fiscal incentives make a difference when making an investment decision. As can be observed in figure 36, five out of twelve companies are indifferent to fiscal incentives. These interviewees mention that it is not a decisive factor, but that it could have a positive influence. Other five out of twelve companies rank this element important or very important sharing that it can give a positive twist to the investment decision, one of them acknowledged that it is currently making use of the EIA. However, it is commented that a fiscal incentive is useless for a company in distress and in the case of the EIA, that it can solely be used when making profit. Like subsidies, are fiscal incentives are not taken into account when making an investment decision. On a general notion, it can be said that fiscal incentives are not a decisive factor and are perceived as an added bonus.

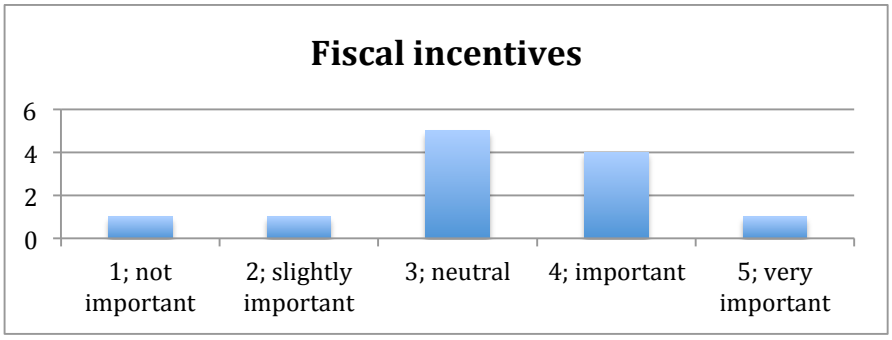


Figure 36 Result of the list of financial elements: fiscal incentives

5.3.12 Administrative burden

Along with applying for financial instruments come paperwork, time and an administrative burden. By including this element in the list it is investigated to what degree the administrative burden is determining an investment decision and how this burden is perceived.

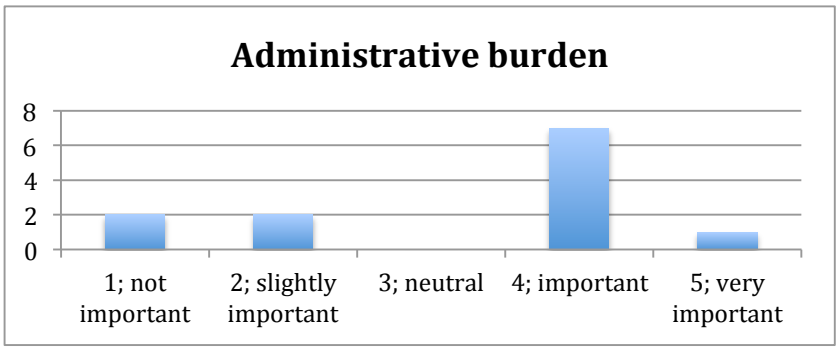


Figure 37 Result of the list of financial elements: administrative burden

In figure 37 it can be acknowledged that the administrative burden is of importance for companies. Eight out of twelve companies rank this instrument as important to very important, various arguments for this ranking were raised. It is of importance as there is limited personnel and time. However, the overhead cost is dependent on the height of the investment. If it is a substantial project, the overhead costs are manageable and less determining. Companies ranking this element as not or slightly important mention that it is not a determinant factor, that the overhead costs are manageable or that it can easily provide the information needed.

From the insights and the rankings obtained, it can be deduced that the administrative burden should be as low as possible. The burden is put in relation to the height of the investment and should be manageable. This finding is to be taken into account when proposing additional financial instruments to improve energy efficiency and considered from a company's point of view.

5.4 Potential solutions

Aside from the list of financial elements, financial instruments were proposed during the interview to measure its success and to obtain initial thoughts. It is thought that these instruments have potential and could be implemented to realise more projects to improve energy efficiency.

5.4.1 Suggestion: revolving fund

Before the interviews took place, the idea was raised that a revolving fund could be a suitable financial instrument. This fund would consist of capital, from the government and/or institutional investors, which can be used to finance energy efficiency projects. The fund could also be used for demonstration or pilot project, as for providing guarantees. The parties making use of the fund to finance projects pay back in agreed upon terms. These payments are channelled back to the fund which can be used to finance other energy efficiency project. This aspect of the fund makes it revolving and ensures continuity. During the interview, the revolving fund was proposed as an off-balance financing instrument.

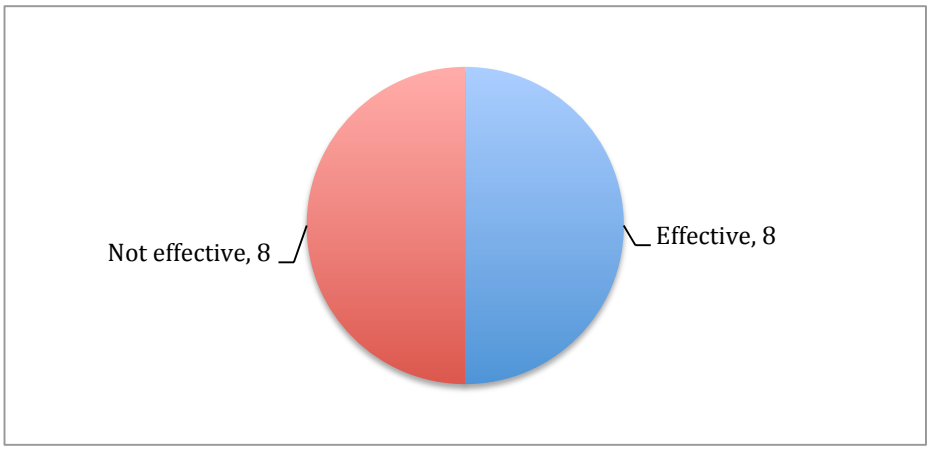


Figure 38 Effectiveness of a revolving fund

It seems that not all companies would make use of the revolving fund and its potential is overestimated. In figure 38 it can be observed that the perceived potential of a revolving fund is split and not as effective as initially thought. The interviewed companies indicating that it would not make use of the revolving fund have in common that the lack of capital is not perceived as a barrier. As these companies do not experience a capital barrier, they would not make use of such an external financing instrument. The companies indicating that a revolving fund would be effective mentioned various arguments such as green branding and that it would be a good incentive. However, it is recognized that the off-balance aspect of the revolving fund may be difficult to realise due to accounting standards and risk assessments. It was also mentioned that it is crucial that it is a neutral fund consisting of parties without conflict of interests. Furthermore one interviewee was opinionated that other streams of capital could also be allocated to the fund, such as capital raised from CO_2 emission rights.

All in all, is the revolving fund an interesting instrument to take into consideration. Only sixteen companies are interviewed for this research, which is not representative for the needs of the industry. It does however increase understanding as to which instruments would be suitable and which not, and more importantly, the reasons behind it.

5.4.2 Incentive to advance projects

Companies taking part in the long-term agreements between the industry and the government are obliged to compose a four-year plan in which they indicate which projects will be implemented in the coming years, these are called EEPs. Aside from the EEPs, companies have their own planning in which an overview is made stating which projects are to be implemented and when. There is no incentive to advance projects, which is unfortunate as the benefits of the project could be reaped earlier on. This may result in a positive effect on the environment as well as benefits for the company which are collected earlier than planned. An incentive to do so was introduced during the interview, a mechanism such as a target holiday where an obtained energy efficiency percentage exempts you from the obligations of coming years (for MJA3 and MEE companies) or an investment subsidy.

Overall, companies reacted positive to the target holiday idea and shared the opinion that this could be a suitable mechanism complimenting the existing long-term agreements. Nonetheless, critical remarks were also raised mentioning that it may be difficult to realise as the investment planning is linked to the scheduled maintenance planning making it difficult to advance projects. Furthermore is there are a certain limit as to how many projects can be executed with the available resources (especially personnel).

The introduction of a capital expenditure subsidy was one of the ideas raised before the interview started which is why it is proposed as a financial instrument during the interview. In chapter 5.3.10 it was concluded that subsidies in general show potential to get more projects implemented. By specifically proposing an investment subsidy, the potential is explored with a focus on one specific subsidy. The result can be observed in figure 39.

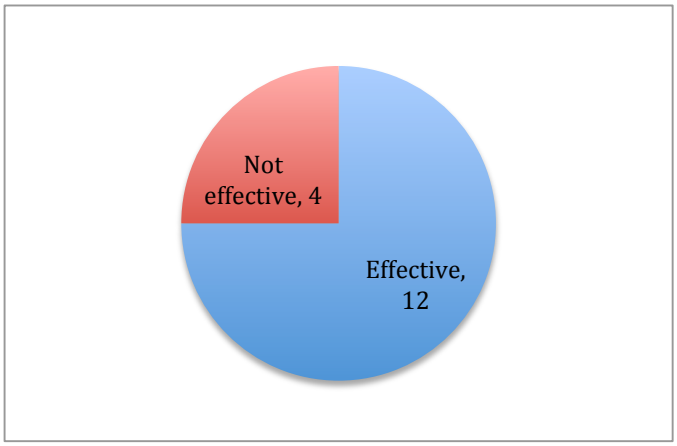


Figure 39 Potential of an investment subsidy

75% of the interviewees indicated that an investment subsidy would help and is applicable. It could also act as an incentive to advance projects and it would help with getting more renovation projects implemented. Renovation projects were specifically mentioned as it is challenging to receive an agreement for these kinds of projects as there is no sense of urgency, such as exchanging aged equipment. The remaining 25% indicating that an investment subsidy would not be effective do not have a lack of capital and mention that this would not introduce a decisive factor. From the insights and results, it can be concluded that an investment subsidy would be effective and that the potential should be further researched.

5.4.3 Proposed solutions

The interviewees were also asked if they had other solutions in mind than those proposed during the interview. These could be instruments from a personal point of view or from experience. In the following text the proposed solutions, which have not been mentioned earlier, are presented.

- One interviewee shared the observation that different parties and organizations make use of different appreciation systems and different units. The interviewee mentioned that he is obliged to share information regarding emissions, amount produced etc. with various parties. The organizations demand different formats and values in a different unit. This increases complexity when values and numbers are to be compared to each other and increases the administrative burden for the company. It is opted that one universal system for reporting values is chosen for effective time management and increasing the ease of comparison
- The introduction of green bonds. The company sells bonds to interested parties (mainly socially responsible investors (SRI), the capital raised from these bonds may only be used for sustainability projects. This introduces a separate budget for sustainability projects in which they do not have to compete with other investment projects as is currently the case
- The introduction of a think-tank of Master students to work out business cases
- The introduction of a subordinated loan (off-balance)
- The introduction of an incentive system where a company is rewarded if certain goals are met, the reward can be a subsidy of a tax incentive.

5.4.4 Hartekreet

At the end of every interview, the interviewees are asked to share a "hartekreet". This can be translated as a cry from the heart and aims to collect short and powerful messages they want to share. The messages collected are refreshing and give a good summary of the interviewees' viewpoints. The "hartekreten" are listed below:

- There should be more stimulation from the government focused on energy efficiency. The government can get more done with stimulating than with demanding. An agreement should be honoured from both sides.
- We will still exist in 2050 and we will by then be a green company!
- Collaboration is key!
- Our company manager stimulates all initiatives and tries to implement projects with a longer payback period than accepted. Enthusiasm helps!
- More flexibility is needed regarding subsidies.
- A payback period of 2-5 years for a volatile industry is long and the market is increasingly becoming more dynamic from all sides.
- The Dutch government should work together with suitable partners and investigate the possibilities of heat recovery instead of looking for ways to provide capital against interesting rates.
- We should take action, it is of societal importance that we increase its importance (energy efficiency and sustainability).
- Energy efficiency first breakthrough technology comes after.
- Just do it. We are greater than I.
- Companies should disengage themselves from a defensive mode and should display themselves as a partner. Leadership is needed.
- Government take responsibility. Say what you do and do what you say, increase reliability.
- More innovation, less fossil fuels. Focus should be more on heat pumps and waste heat utilization.
- As industry we can do much more than what we are showing now and we should stimulate Europe more in comparison to investments in other continents. More government-industry partnerships.

5.5 Interim conclusion

Sixteen companies are interviewed, of which ten companies participate in the MEE covenant and six in the MJA3 covenant. From the interviews it can be concluded that not all companies experience a lack of capital barrier. Furthermore are there multiple projects with a payback period of two to five years that are not implemented. These projects are of varying sizes and are not implemented for several reasons:

- The payback period is too long (>3yrs)
- Lack of budget
- No enforcement
- No sense of urgency

At many interviewed companies the low hanging fruit has been implemented already. To achieve substantial energy savings, radical implementations and innovations should be introduced which are coupled with risks and high investment amounts. Furthermore can it be

concluded that companies which are close to the customer value sustainability and energy efficiency more than companies situated earlier in the chain. The cause of this is anticipated to be social pressure and green branding. Nonetheless is energy efficiency a subject which is gaining importance on the company level, reaching management.

When ranking investment project, compliance investments (HSE) are ranked on high on the list. After compliance, replacement and strategic investments are listed. It is observed that for strategic investment, a longer payback period is accepted and that a shift in the investment strategy is recognized where sustainability and/or energy efficiency is appreciated when projects are judged. End-users also commented that there is no enforcement, leading to companies not being aware (on purpose?) of the sense of urgency. The industry should moreover take an active stance in the energy transition, it should realise that it is in the possession of projects that could help achieving nationally set goals.

Aside from energy efficiency, other relevant subjects show potential to improve energy efficiency in the industry. These are industrial symbiosis, a heat network, a level playing field and CO_2 pricing.

The findings obtained by filling in the list consisting of financial elements resulted in interesting insights. It can be observed which financial elements are perceived as decisive factors when making an investment decision. These insights should be taken into account when devising and proposing (new) financial elements. The following elements are recognized as being critical:

- On-/off-balance
- Guarantees
- Duration of the contract
- Performance guarantee
- Subsidies
- Administrative burden

The diversity of answers given during the interview and the insights obtained from the list of financial elements show that the solutions are contextual. In comparison to wind farms, solutions for industrial (energy efficiency) projects should be custom made as every company operates in different markets, has varying boundary conditions and different needs. From the interview it can also be concluded that the interviewed companies share the opinion that there is a lack of knowledge on all levels of the government and a lack of enforcement. More conversation between the government and the industry is encouraged. It was mentioned several times that compared to the Dutch government, the interviewees are opinionated that the Belgian and German government are more knowledgeable. There is furthermore no sense of urgency and the lack of enforcement results in projects not being implemented, although it is demanded by legislation. Off-balance financing schemes are of interest for many interviewed companies, the downfall however is the fact that it is strenuous to make an instrument or agreement off-balance. Maintaining an agreement off-balance will become even more challenging with the IFRS accounting standards changing on the 1st of January 2019.

6. Data analysis III - Survey financial instruments

The last part of the research is a survey consisting of various financial instruments (existing and potential instruments). It is perceived as a crucial step to confirm the deduced results of the interview and will help to gain insight in which financial instruments are effective and which are hindering.

6.1 Survey set-up

The survey is only sent to the interviewed end-users; their assistance is requested during the interview and all interviewees agreed to participate. This ensures a high response rate and all participants are aware of the context of the research. This, in turn, increases reliability as the involved parties have the same level of understanding.

The survey focuses on financial instruments that can help stimulate energy efficiency in the industry. It is the result of desk research and interviews with technology suppliers and end-users. In each question, the instrument can be rated accordingly to its perceived effectiveness. "Hindering" meaning that the instrument would be counterproductive to implement more efficiency projects and "Effective" meaning that this instrument would be of help to your company to realise more projects. The end-users were also requested to explain their answer as this would increase understanding and they were invited to provide comments, prerequisites or a proposal for a change of conditions in such a way that the instrument could be applicable to the respective company. An example question and the lay-out of the survey can be observed in figure 40. In appendix F, the various financial elements are listed with their respective advantages and disadvantages.

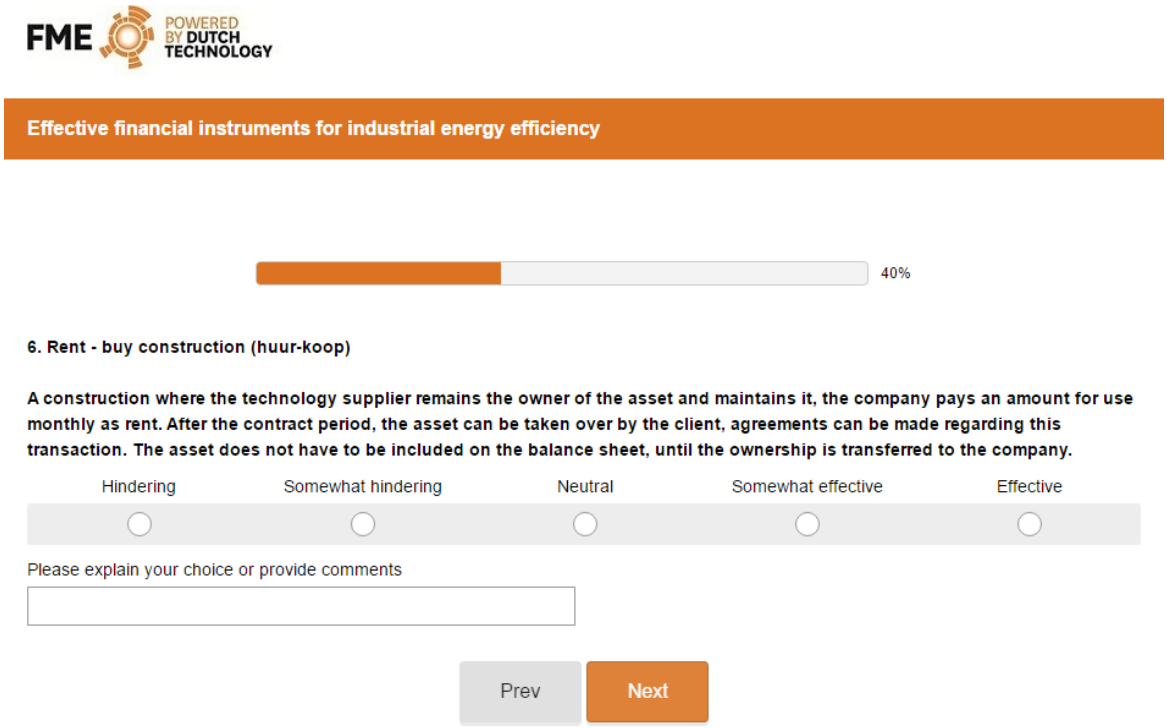


Figure 40 Example question - lay-out survey

6.2 Survey outcomes

Thirteen out of the sixteen interviewed companies responded, which results in a response rate of 81%. In figure 40, the division of MEE and MJA3 companies can be observed. In the process of observing the results, no differentiation is applied that divides the result of MEE companies and of MJA3 companies. This approach is perceived as most effective as the amount of interviewees and the amount per long-term agreement is not sufficient to be representative for the industry nor for the effects per long-term agreement. This research and its findings are aimed at obtaining insights from which further research can be conducted. The outcomes of the survey will be presented and discussed per financial instrument. The figures depicting the result of each financial instrument shows the number of times an answer is given, thus the y-axes portray the amount of times answered and the x-axes portray the effectiveness.

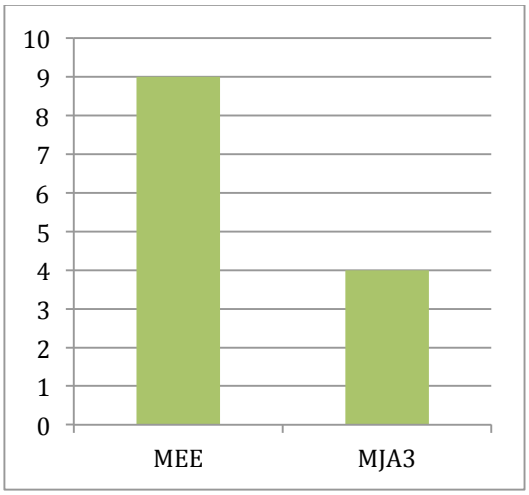


Figure 41 Division MEE/MJA3 respondents survey

6.2.1 Energy Performance Contracting

A construction where the ESCo (Energy Service Company) is responsible for financing, operation and maintenance. The ESCo can be employed to improve the *overall energy efficiency* of the company in which guarantees are given to ensure improvement. Additional savings will be shared between ESCO and client. For a pre-agreed period, the company pays back the ESCo in instalments from the energy costs savings. ESCo can also be used for *contract energy management* where the ESCo is responsible for an utility (steam/heat/water) and the company purchases the output from the ESCo. ESCo provides guarantees to ensure supply and the company can increase its focus on the core-process.

This instrument is divided into two mechanisms as both options were mentioned during the interviews, with contract energy management originating from an interview with a technology supplier. It was brought up by several end-users that they observe potential in the utility sphere, less risk, than in investments in the core-process. Contract energy management is focused on the utilities and by including this mechanism in the list, its likelihood of implementation is investigated. The main difference between the overall energy efficiency improvement and contract energy management is that the latter is focused solely on utilities. With overall energy efficiency improvement, the ESCo guarantees a certain percentage of saving per time period.

This saving can originate from improvements in the utility sphere, this is however not necessarily the case and the ESCo may apply improvements on other places as well.

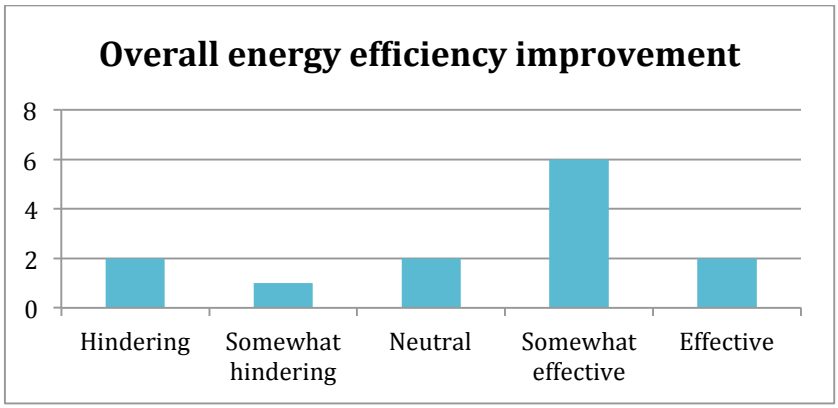


Figure 42 Results survey: overall energy efficiency improvement

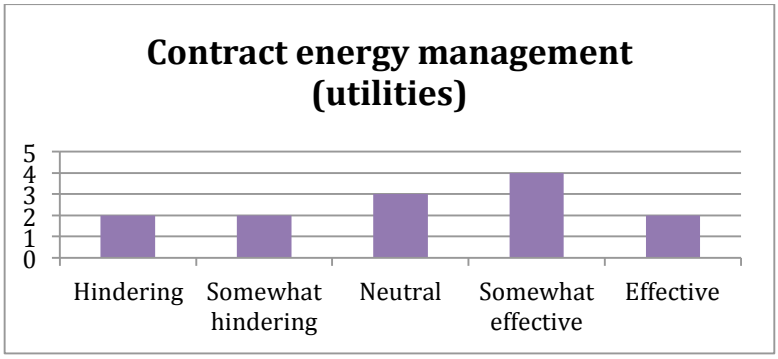


Figure 43 Results survey: contract energy management (utilities)

With minor differences, a same division can be observed for both versions of utilizing an ESCo in figure 42 and 43. Overall, it can be said that the instrument could be effective and its potential should be explored. The overall energy efficiency improvement is regarded as more effective by the respondents than contract energy management. This can have several explanations, the difference or mechanism is unclear or it can be difficult to imagine that the utilities are outsourced. Out-sourcing of the energy is perceived as an increased risk factor, especially as the utilities are very important for the continuation of the process.

The respondents that answered that this instrument would be hindering note that it is difficult to imagine how an ESCo can effectively operate and maintain on another company's manufacturing site. This comment is understandable and also an important aspect when looking into the possibilities of an ESCo construction. Arranging an ESCo construction is coupled with a long period of establishing trust as the ESCo may have access to company sensitive information. It is also mentioned that ESCo's normally increase costs and that ESCo's are not focussed on the total process, but only have a limited view. It is argued that this may result in split incentives where the ESCo pursues other interests than the company. This observation can be recognized as a disadvantage, but it can also be perceived as an advantage where the ESCo unburdens the company, which in turn can focus more on its core-process. There can be a split incentive barrier, but this can be solved by establishing a good relationship of trust, clear and solid agreements and a good alignment of goals.

Anther comment shared is that the possibility of engaging in such an agreement is dependent on the effects within the IFRS/US GAAP accounting rules. As the IFRS rules regarding leases is expected to change from the 1st of January 2019 on, the effect of these mechanisms on financial ratios and sheets should be researched. Nonetheless are these mechanisms recognized as instruments that can help to improve energy efficiency without needing capital expenditure.

6.2.2 Financial lease

The company selects an asset and makes use of a financing party to finance the investment. For a pre-agreed period, the company pays back the financing company in instalments. The company has the option to acquire ownership of the asset after the contract period. Maintenance and operation is the responsibility of the company, the asset will have to be included on the balance sheet.

A financial lease is an existing instrument and included on this survey to put in relation with the other financial instruments. Furthermore is it of interest to investigate if companies perceive this existing instrument as effective, increasing understanding of their motives and discovering its potential. Following from the answers provided by the respondents (see figure 44), it can be observed that the results are dispersed. The respondents argue that it would not work as it is not an off-balance financial instrument and that the expected changes in the accounting standards will limit the benefits of this method. Furthermore does this instrument not affect the decision making process nor is it different from financing directly as the debt will still appear on the balance sheet. Respondents also mention that financial lease contracts are not allowed or will not be approved as they are in a financially strong position.

From the comments and answers it can be deduced that a financial lease is not a suitable instrument to improve energy efficiency in the industry. Two strong arguments are provided for this conclusion; the instrument is not off-balance, thus financial ratios will be affected and its benefits will be limited due to changing IFRS/US GAAP accounting standards concerning lease constructions.

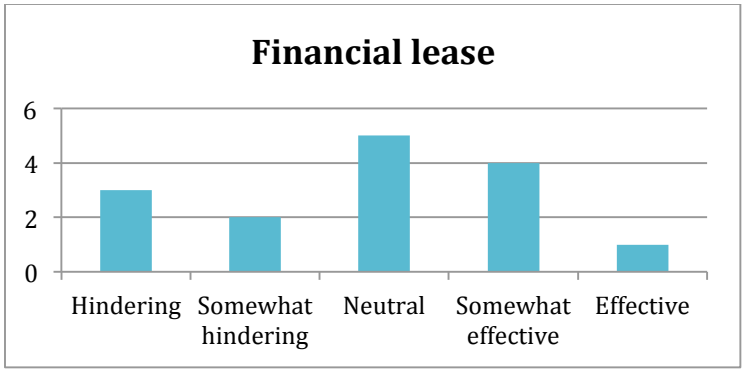


Figure 44 Results survey: financial lease

6.2.3 Operational lease

The company selects an asset, the supplier providing the asset is responsible for financing, operation and maintenance. For a pre-agreed period, the company pays back the financing company in instalments which can be accounted for as operational expenses. The company has the option to acquire ownership of the asset after the contract period or to renew the contract.

The supplier remains the owner of the asset. Depending on the accounting practices and guidelines used by the company, the asset should or should not be included on the balance sheet.

The operational lease as a financial instrument is included in this survey for the same reasons as the financial lease. It is an existing instrument, with the main difference being that an operational lease can be accounted for off-balance and a financial lease is on-balance. This also explains the difference in results when figure 44 and 45 are compared to each other. It is moreover expected to be an effective instrument for stand-alone utility supply equipment (e.g. steam boilers), but not for improvements in the existing manufacturing plant. An explanation for this remark is that the risk and equipment ownership differs in both situations, affecting its position on the balance sheet. It was also mentioned by one respondent that he is not allowed to have operational lease contracts due to accounting standards.

It can be concluded that operational lease is more effective than financial lease. However its success is dependent on multiple factors, such as the ownership of risk and the accounting standards the company adheres to. Just as financial leases, is it expected that the benefits of an operational lease will be limited due to changing IFRS/US GAAP accounting standards. Nonetheless, does the difference in result between the financial lease and operational lease confirm that on-balance or off-balance makes a substantial difference, and that off-balance is preferred.

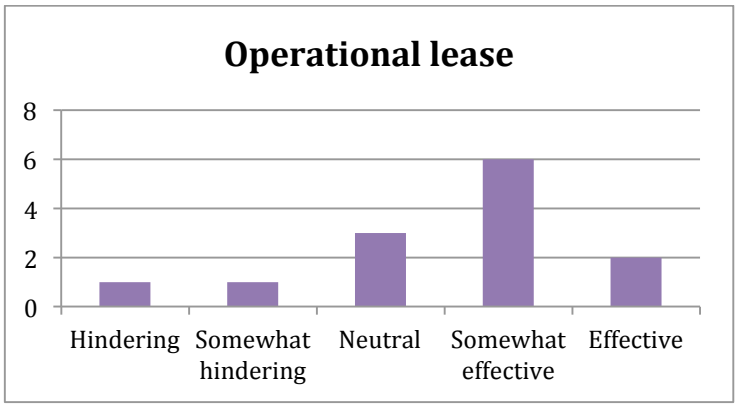


Figure 45 Results survey: operational lease

6.2.4 Rent-buy construction

A construction where the technology supplier remains the owner of the asset and maintains it, the company pays an amount for use monthly as rent. After the contract period, the asset can be taken over by the client, agreements can be made regarding this transaction. The asset does not have to be included on the balance sheet, until the ownership is transferred to the company.

The rent-buy construction is a new financial instrument as proposed by a technology supplier. The construction opted is appealing and shows potential to improve energy efficiency on an industrial level as it is based upon preferred financial elements (off-balance, no initial investment). Currently, the supplier has such an agreement with one end-user. The result of this instrument, which can be observed in figure 46, is optimistic and confirms its potential. The respondents argue that this instrument shows potential but remark that the operational risk could be an issue if the rent-buy construction is applied on an integral part of the plant increasing dependency. Its effectiveness is recognized, but it is also argued that it could be more

expensive than other options (e.g. ESCo, financial lease or operational lease). During the interview with the technology supplier that proposed this construction, it was already determined that this construction is not a verified instrument yet and that it needs fine-tuning. The result of the survey demonstrates that the potential should be researched and that the interviewed companies perceive it as effective so that more projects can be implemented.

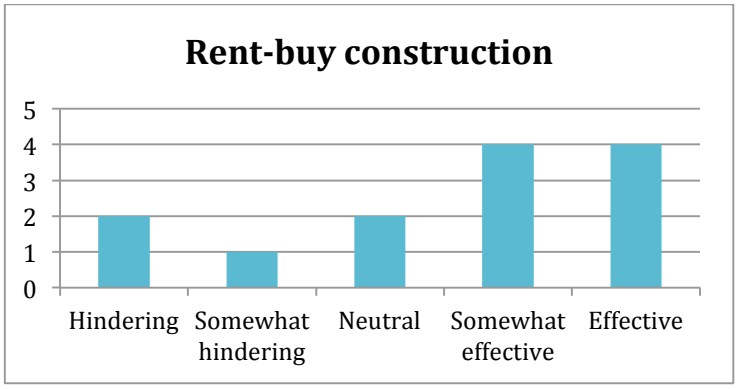


Figure 46 Results survey: rent-buy construction

6.2.5 Government guarantee

A bank or investor provided a loan to finance the asset. A guarantee from the government to pay back the loan could help in lowering the risks for both the company and the bank/investor, and to cover the unpredictable component of return. It could lower the threshold when making an investment decision and stimulates the implementation of projects where uncertainty is an influential barrier.

Guarantees as a financial element were introduced in chapter 5.3.4, it is concluded that guarantees could have a positive effect on a company's investment strategy. In this survey, a government guarantee is introduced as a financial instrument. In this case, the government is recognized as a responsible and suitable party to provide guarantees to the industry. The respondents shared that a government guarantee would help in attracting extra financing as uncertainty for the financing party is lowered (see figure 47). It is also argued that this model would not help a large company/cooperation because of the substantial investment amounts. Five out of twelve ranked this instrument as neutral, with six out of thirteen ranking it (somewhat) effective. It can therefore be concluded that a government guarantee would help, but is not a decisive factor. The same result was observed from the list of financial elements, confirming the concluded notion.

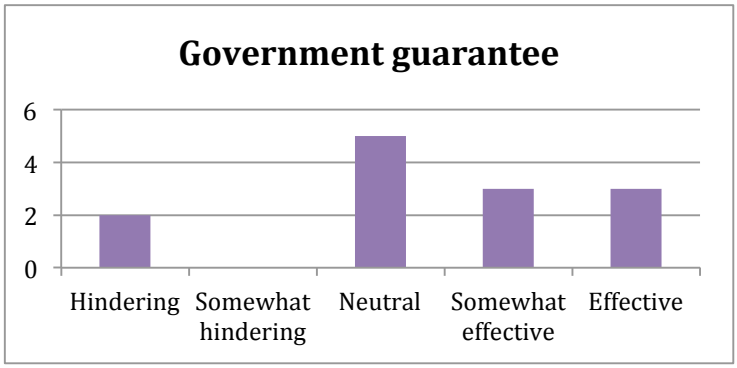


Figure 47 Results survey: government guarantee

6.2.6 Energy efficiency investment fund

The introduction of a (revolving) fund which contains capital from banks, government and/or institutional investors. The capital is earmarked for energy efficiency projects and can be lend at below market interest rates. The company repays the fund in pre-agreed terms, from which the capital can be deployed again to finance other energy efficiency projects.

The effectiveness of a revolving fund is introduced and discussed earlier in chapter 5.4.1, the opinions were divided in half with eight of the sixteen interviewees opinionated that a revolving fund would be effective. The answers provided can be examined in figure 48. Although it looks as if this instrument can convincingly be regarded as effective, this may not be the case. When looking at the amount of respondents that answered somewhat effective or effective, exactly eight respondents answered positively. This corresponds to the eight interviewees who indicated that a revolving fund would help in implementing more projects. Respondents commented that the fund should be off-balance and one company even mentioned that they are in the middle of a trial regarding this sort of instrument.

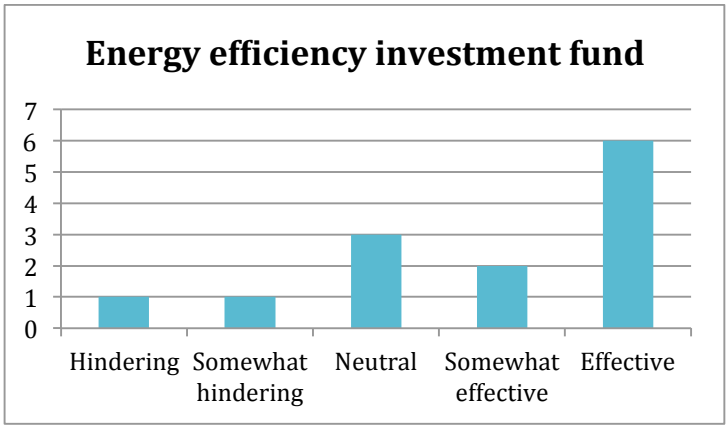


Figure 48 Results survey: energy efficiency investment fund

One respondent shared a very valuable remark. He opted that when a technology does not work, which is financed using capital from the fund, then the loan does not have to be repaid. This may appear counter-intuitive, but for (radical) innovations this could be a proper incentive. It is mentioned before that many interviewed companies already implemented low hanging fruit options. To realise a significant energy efficiency improvement, radical innovations should be implemented which are paired with high investment amounts. Companies are reluctant to implement these projects, there is no sense of urgency and it is paired with a high degree of risk. However, in a rapidly changing environment, radical innovations are needed to strengthen competitiveness on a national and global scale (Ministerie van Economische Zaken, 2016). This arrangement could convince companies to take the leap in investigating radical innovations. When the fund is successful and used to finance multiple projects, several drawbacks in comparison to many thriving projects is acceptable and would not limit the fund. Nevertheless should the potential of the fund be investigated and is a proper system needed to assess the projects.

6.2.7 Investment subsidy

Investment subsidy provided by the public sector for a project that increases energy efficiency. This will aid in lowering initial investment, and thus the payback period, and lowering the threshold to implement the project.

In chapter 5.4.2 the investment subsidy is briefly introduced as an incentive to advance projects. 75% of the interviewees, twelve out of sixteen, shared the viewpoint that an investment subsidy would be effective. From the amount of respondents labelling this instrument as (somewhat) effective (see figure 49), it can be deduced that this is an appropriate instrument to improve industrial energy efficiency and to achieve that promising projects with a payback period of two to five years are implemented. The comments provided by the respondents were very optimistic, mentioning that such an instrument would be very effective and result in shortening the payback period. It is also commented that an investment subsidy would help in getting a project higher on the list of projects to be implemented by using it as an argument for justification. However, a downfall with subsidies is that they are not taken into account when the decision is made. Hence there should be certainty that when the subsidy is allocated, a change of rules will not affect this allocation. Despite the positive comments and results, research is needed to investigate its boundary conditions within (national and European) regulatory frameworks, its target group and the exact application.

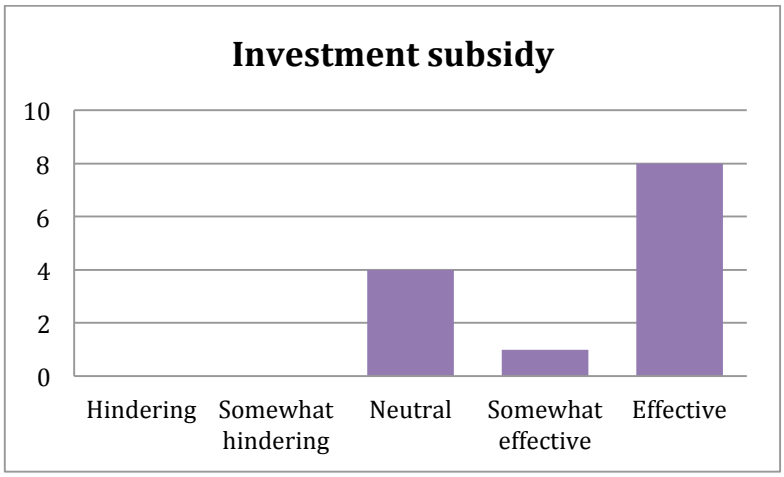


Figure 49 Results survey: investment subsidy

6.2.8 Subsidy for energy efficiency

A mechanism, such as the SDE+ for renewable energy, for energy efficiency, where subsidy is receives as compensation for the unpredictable component of retun or inevitable losses of your investment. This may act as an incentive to invest in energy efficiency.

The advantages of the SDE+ subsidy, as highlighted by the end-users during the interview, were specified in chapter 5.3.10. It was pointed out that the SDE+ subsidy differs from other subsidies as it is on a contract base. This decreases uncertainty and ensures that the subsidy is allocated for a certain period, removing the disadvantage of subsidies mentioned earlier. During the interviews, a SDE+ subsidy model for industrial energy efficiency was proposed by several end-users. From the observations made during the interview, it can be presumed that the interviewed end-users are very positive about this instrument and its effectiveness. This assumption is confirmed when looking at the result of the survey in figure 50.

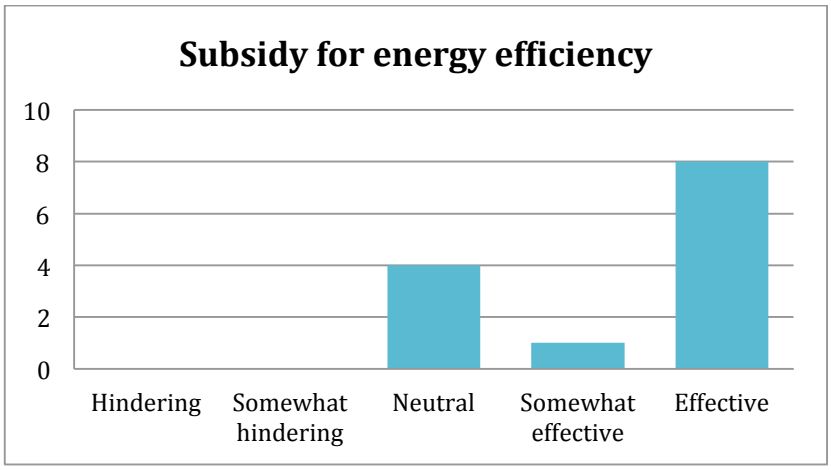


Figure 50 Results survey: subsidy for energy efficiency

The justification for this optimistic result is similar to the comments provided for the investment subsidy in chapter 6.2.7. The benefit of the SDE+ subsidy model increases predictability, making it easier to finance projects. It moreover reduces risk and capital outflow, having a positive effect on the return on investment. An allocated, ensured, constant subsidy is a solid argument which can be used to justify an investment decision, stimulating the implementation of energy saving projects. Aside from all the positive comments, one respondent (which ranked this instrument as neutral) commented that he is not a proponent of operational subsidies and is hence sceptical if the company would make use of the subsidy. In general, it can be deduced that this instrument is potentially very effective and many companies would make use of it. However, its conditions within (national and European) regulatory frameworks should be investigated as well as potential drawbacks.

6.2.9 Private equity and venture capital

Investing in early-stage and expansion-stage energy efficiency companies, which are not stock listed, and projects with the potential for substantial capital appreciation. The investor often partners with other specific funds and strategic investors to provide additional equity funding to the investment.

This proposal is different from the other aforementioned instruments as it is aimed at investing in early-stage and expansion-stage energy efficiency companies. The interviewed companies do not focus on energy efficiency as part of the core-process, it is nevertheless relevant to this research that their viewpoints are taken into consideration. It is included to review if more capital of this form is required and if it is perceived as an effective measure. In the survey, this instrument is the only question which includes 'not applicable' as an option. This is included as private equity and venture capital can only be invested in companies that are not stock listed and in projects with the potential for substantial capital appreciation. As the prerequisites are more specific than the other instruments, an extra option is included.

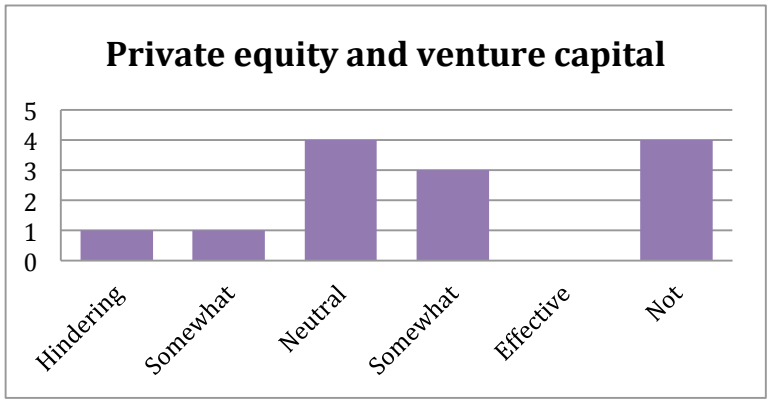


Figure 51 Results survey: private equity and venture capital

Deducing from the results (see figure 51), it can be concluded that this instrument would not be as effective as others. Respondents commented that it should moreover be off-balance and that it is very unlikely this instrument will be used. Furthermore raises this instrument concern as to the existence of a knowledge barrier and if the financing party has sufficient knowledge to judge the risk factor of the project or venture. For the interviewed end-users, this instrument would have no effect and shows no potential.

6.2.10 Subordinated loan

A subordinated loan issued by the public sector or investors. In times of bankruptcy, a subordinated loan is revoked last. Due to risks and uncertainty for the financing parties, the interest rate may contain a risk premium. The length of the loan can be agreed upon, as well as the payment schedule.

From confidential conversations with stakeholders, aside of the interviews with the technology suppliers and end-users, a subordinated loan was mentioned multiple times as a suitable instrument. The result, which can be observed in figure 52, is therefore surprising and unexpected. Respondents argue that these structures can be very complex for multinational companies, one respondent even states that it will not help. Others are sceptical and mention that it will still be on-balance, have a higher interest rate and influence the overall credit rating of the company. Positive comments were also shared remarking that the instrument is more or less the same as a government guarantee, thus it is perceived as a positive instrument that may result in more projects being implemented.

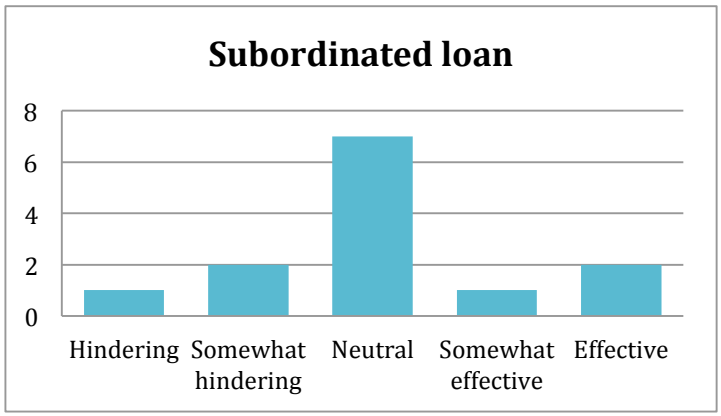


Figure 52 Results survey: subordinated loan

The misconception between the expected outcome and the survey results can be explained by several reasons. Firstly, could it be the case that the description of the instrument is not clear enough. This results in respondents being confused about the intention, in which case it is appealing to choose 'neutral'. Secondly, the concept and the possible benefits (can be accounted for as equity/flexible payment) of a subordinated loan are not well understood. The structures can be complex and different than other loan structures, resulting in companies becoming hesitant.

6.2.11 Target holiday

Currently, there is no incentive to advance projects (which are in reality scheduled at a later period in a companies' planning). This incentive entails that if you implement a project that has a significant energy efficiency improvement, you are exempt from the annual obligatory saving (according to MEE/MJA3 covenant) for the years that follow.

The end-users were optimistic towards this idea during the interviews, which is why it was included in this survey to find confirmation. The result corresponds to the positive insights obtained during the interviews with the end-users. It is commented that this would work well with other instruments and that it could potentially help in implementing more projects. Moreover should this always be the case, instead of introducing an incentive to do so and a good project should not be used against as leverage against the company at a later stage. The latter meaning that by implementing an interesting project with significant savings, it cannot be the case that you are penalized on a later stage for not being able to meet annual targets as set by the MJA3 or MEE covenant. See figure 53 to observe the results.

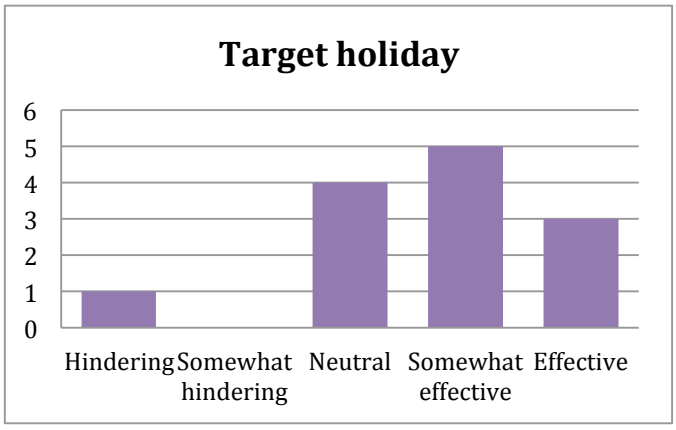


Figure 53 Results survey: target holiday

The intriguing aspect of this result and the findings obtained during the interviews is that allegedly, this mechanism already exists. During conversations with a colleague from FME, who deals with energy policy and the long-term covenants, it became apparent that a substantial saving from one project, might lead to the exemption of annual targets. However, no interviewee mentioned this during the interviews or in the comments of the survey. This can be explained by miscommunication where the end-users do not realise this is already part of the covenant or the end-users are not aware of this arrangement and its existence. This finding raises concern and should be investigated.

6.2.12 Other suggestions

The survey is not exhaustive and it could be the case that financial instruments or arrangements are overlooked. For this reason, the respondents were asked if they had other suggestions to improve energy efficiency in the industry. The following suggestions were proposed:

- More support for "breakthrough" technology
- Extra exposure of third party financing options to the heavy industry. The concept is good but the benefits not well understood
- There is a need for very efficient and economically viable technologies
- Arrange a system in such a way that income out of ETS is channelled back to stimulate/facilitate investments in energy efficiency
- We should look at the entire chain and do more with waste heat
- Innovation funding
- There are enough existing opportunities, but the focus is often on core business.

Most suggestions shared are mentioned before, the only comment that is of interest is innovation funding. In a way, this was already implied in chapter 5.4.1 where capital from the revolving fund can be used for innovation funding.

6.3 Interim conclusion

The survey resulted in valuable insights and confirmations of statements made during the analysis of the interviews with the end-users. It has increased understanding regarding motives and has shown that varying financial elements can make the difference. From the survey it can be concluded that the following financial instruments are expected to be effective:

- ESCo (overall and utilities)
- Operational lease
- Rent-buy construction
- Energy efficiency investment fund
- Investment subsidy
- Subsidy for energy efficiency
- Target holiday

7. Integrating results and discussion

The results of the practical component of this research has led to refreshing and thought-provoking insights. The findings increase understanding and confirm the complexity of energy efficiency. Several observations raised concerns in various parts of the analysis. The most striking findings are discussed in the following text.

7.1 Investment categorization

In chapter 5.2.2 it is mentioned that only one interviewed company accepts different boundary conditions for sustainability investments. It has already implemented "quick wins" projects and it has accepted that sustainability investments are paired with long payback periods. This is however not perceived as a barrier and has led to the prerequisite that for sustainability investments, longer payback periods are accepted. These projects are valued differently and are decoupled from other investment projects (such as HSE investments). Two other companies have introduced a sustainability ranking on which projects are valued. This means that aside from profitability, the effect on the environment and the environmentally long-term perspective is taken into account. On the contrary a negative and concerning observation was shared by one end-user. He proposed a project with multiple benefits and an IRR of 20%. However, because the IRR was below the internal boundary condition (20% instead of 40%) the project was not taken into consideration. A separate sustainability ranking could, in this case, make a difference.

In chapter 5.2.1 it is quoted that companies are driven by profit, followed from Milton Friedman's statement that "*the social responsibility of business is to increase its profits*" (Friedman, 1970b).
Although monetary drivers are perceived as leading by companies, why do companies not see the long-term perspective and their position in the energy transition? As major consumers of energy, energy efficiency improvements in the industry have sizeable effects. It will not only bring benefits to the environment, but also benefits to the company in terms of competitiveness and decreased volatility to changing energy prices. An explanation as to why sustainability projects are not evaluated differently from other investment projects can be that the benefits of energy efficiency have not been properly monetized yet. Furthermore, as energy efficiency is often perceived as a side benefit, it may be difficult to predict the exact improvement of energy efficiency. This uncertainty increases complexity when valuing an investment and may lead to projects being overestimated (due to an included uncertainty margin). It is desirable that the realisation of these benefits leads to an altered investment decision making process where sustainability investments are valued differently from other projects.

7.2 Knowledge barrier and more enforcement

One of the interim conclusions from the interviews with the end-users is that there is a lack of knowledge on all governmental levels (municipality, executive level and policy level). On one side it hinders the potential of energy efficiency, on the other side it is mentioned that this knowledge barrier is understandable. These statements contradict each other. Understanding technical complexity is challenging; especially as there many different industrial processes. To demand that the government should be knowledgeable of all of them is too much to ask for. Understanding the processes, the benefits, the effects on the process, but also the benefits from a

business perspective requires experience and insight. To what extent should knowledge and expertise be present on governmental levels?
A striking remark obtained during the interviews with the end-users is the observation that knowledge is present across borders. The Belgian and German government are considered as proper partners to have technical conversations with. One of the interim conclusions of the interviews with the end-users is that companies participating in the MJA3 covenant do not experience a sense of urgency as there is no enforcement. Enforcement of the Wet Milieubeheer, which is applicable for MJA3 companies and companies that have an annual energy consumption of minimally 50.000 kWh of electricity and/or 25.000 m^3 of natural gas, is the responsibility of local municipalities. Companies are obliged to implement projects with a payback period up to five years according to the Wet Milieubeheer, however companies do not feel the need to comply as this statute is not enforced. This results in projects with potential being set aside. MJA3 interviewees shared that one of the reasons that there is no enforcement is because municipalities are not knowledgeable and thus are not suitable to enforce this regulation in the Dutch industry.

It can also be concluded that the investment decision-making process at companies are not aligned with national goals. Projects with potential to positively affect the environment are not implemented, even though they are promising and could help in reaching national goals more rapidly. Although both parties (companies and government) have different objectives, it should be recognized that there ought to be more alignment. It cannot be expected from companies that all experience an intrinsic drive to be as energy efficient as possible, and that it complies with regulations on an individual note. Effective enforcement is in this case the connecting element, which is currently absent. The term “more enforcement” carries a negative connotation and should not be misunderstood. It is not to be seen as a punishment, but as a process of aligning goals and ensuring that legislation is properly applied. If the government want to harvest the potential of energy efficiency and wants to reach the national sustainability goals responsibly, more effective enforcement is essential.

On this note, expertise is present at the Dutch government, only not on the municipality level but at the executive level (RVO). As the executor of the covenants, its knowledge should be implemented more efficiently. It is therefore suggested that the officers of RVO are coupled with local municipality officers for company visits. This will increase understanding, willingness and trust. The golden mean between expertise, insight and knowledge should be explored and more collaboration of RVO and municipalities together is perceived as a suitable solution which can be easily implemented. It is apparent that the level of knowledge at the Dutch government is below the desired standard and that they are not perceived as a trustworthy partner to collaborate with. Increasing knowledge and gaining insight will take time, but will have positive effects on the long-term. The government should be perceived as a suitable partner where one can be heard and, most importantly, understood.

7.3 Preference for off-balance arrangements

Off-balance is one of the key reasons some financial instruments are ranked more effective than others. However, how realistic is this and is it a valid argument? It is mentioned several times before in the text; determining if an arrangement is off-balance and establishing that status is challenging. It is moreover contextual and dependent on the agreement made between the participating parties. As it is contextual, the ranking of the financial instruments according to

effectiveness may be unreliable. Nonetheless, it can be concluded that if an agreement can be arranged in such a way that it does not have to be included on the balance sheet, this increases its likelihood of success. Although off-balance constructions are opted by many interviewees, this perspective is subject to change in the near future. From the 1st of January 2019, all lease constructions will have to be included on the balance sheet of the company. This may affect the investment strategy of companies as financial ratios will change, resulting in a lower credit rating.

From the interviews with the end-users and the survey, it can be concluded that subsidies and a revolving fund could make a difference. The enthusiasm for subsidies is understandable, it is capital that does not have to be paid back, it can act as an incentive and it can be used as an argument to convince the decision makers to implement a project. It may shorten the payback period and it is moreover separate from the on- and off-balance argument. However, how realistic is this suggestion when there are economically interesting projects with a payback period of two to five years? Aside from the positive remarks by interviewees regarding subsidies, it was also mentioned that subsidies also introduce an element of uncertainty and that they are not taken into consideration when making an investment decision. Furthermore is it not allowed to subsidize projects that are compulsory by law (think of Wet Milieubeheer and the five year payback period) (Europese Commissie, 2014). With the focus of this research being on projects with a payback period of two to five years, this statement negatively influences the success of subsidies on the potential projects shared during this study. It can therefore be concluded that although subsidies would be off-balance (not influencing financial ratios), it would not be a suitable solution to overcome the capital barrier.

Based on the results of the interviews with the end-users and the survey, it can be derived that off-balance is an important factor in an investment decision as companies do not wish their financial ratios to be negatively influenced. Aside from companies opting for off-balance agreements, some interviewees also shared that strict accounting standards limit them from implementing off-balance arrangements or that its loan capacity is maximized. This demonstrates that financing the potential projects is contextual, they should be valued case by case and every company has different internal limitations. Two out of sixteen interviewees argued that a subordinated loan would be the most suitable solution. It was therefore included in the survey of financial instruments. Remarkably, the results of the survey do not show a high likelihood of success although it would be a very appealing instrument as it is an off-balance arrangement for project finance. With the limited level of knowledge regarding changing accounting standards, it is implied that utilizing a subordinated loan in this situation will not be affected by the new IFRS rules. This can be explained by a knowledge barrier or miscommunication where the description of the instrument in the survey is not evident for the respondent to understand. It could also be the case that this instrument is unknown to the respondents, there is a lack of “best practice examples” and companies are unaware of applying this instrument for project finance. Although the survey does not confirm its potential, a subordinated loan maintains to be perceived as a suitable instrument in this study.

As mentioned earlier, an arrangement is off-balance dependent on the ownership of risk and equipment. To determine this for multiple projects, which are contextual, expertise and financial engineering is needed. Furthermore to link capital (institutional investors) to potential projects (companies), it is apparent that the knowledge barrier should be bridged. To connect both

parties, a common language should be introduced where valuating projects is standardized. Several arguments can be given for this suggestion:

- Financing projects, which are contextual, are expensive as the overhead costs are high,
- Increases ease of comparison,
- Lowers the communication barrier,
- Provides insight in the success and the risks of a project.

A suitable solution is the introduction of a risk assessment tool where the likelihood of success and the operating and technology risk of the project are evaluated. Based on this evaluation, projects receive a rating (e.g. A^+, A, B) which provides insight to institutional investors. In this line, institutional investors do not have to be knowledgeable and are provided an easily understandable unit which is supplied by trustworthy parties with technical expertise. It is expected that this risk assessment tool will positively affect investments in potential projects in the industry and may help in the on- and off-balance discussion by increasing understanding.

7.4 Changing capital budgeting method

When referring to investment projects, interviewed companies evaluated investment projects based on the payback period. Although it is a simple method, it may not provide the proper results. Compared to the IRR and NPV method, payback period as a capital budgeting method is static. It does not take into account the time value of money and other possible benefits are not included. Furthermore it is not possible to add a degree of uncertainty/certainty when using payback period, resulting in an outcome which does not take into account future changes or predictions.

Up until now, energy efficiency benefits are not monetized yet. This could change in the near future when more is known regarding the benefits of energy efficiency, such as benefits on the health and the well-being of employees or macro-economic benefits. The monetization of these benefits would be valuable as these could be taken into account when making an investment decision. By monetizing these benefits, they can be included in future calculations. This is however not possible with the payback period as a capital budgeting method. It is therefore suggested that companies use a different capital budgeting method when evaluating investment projects, not only to monetize future benefits but also to take into account the time value of other factors and uncertainties. This notion can even develop into a standard in which all companies utilize the same units, uncertainty degrees and same value to monetize the benefits of the project. This increases ease of comparison and increases validity of the results. Nonetheless, to ensure validity, the values should be provided by a knowledgeable and neutral party (e.g. government and/or research institutes).

7.5 Target holiday: new or old?

In chapter 5.4.2 a mechanism named a 'target holiday' for MJA3 and MEE companies is introduced. Varying answers are presented, many companies reacted positive to this suggestion. Two out of sixteen companies however mentioned that the target holiday would not result in an earlier implementation of projects. This is due to a limited capacity of personnel and the planning of projects which is linked to maintenance stops. Additionally it would increase the risk a company is taking as more projects earlier on will result in a high total investment amount. In chapter 6.2.11 the results of proposing this mechanism as an incentive to implement more projects are presented. Derived from the interviews with the end-users and the results of the survey, the target holiday mechanism is perceived as an effective measure to improve the energy

efficiency in the industry. What raises questions is that seemingly such a mechanism already exists as indicated during personal conversations with a colleague at FME who is active in the policy department regarding energy. If such a mechanism already exists, why was it not mentioned during the interviews or in the comments of the survey? It could be the case that the interviewee is not aware of its existence or that he is not the designated person that handles the proceedings surrounding the covenant. However, it can also be explained as miscommunication between industry and government (executive and policy level) or miscommunication between interviewer and interviewee. The foundation of this miscommunication should nonetheless be explored. If the outcome is negative, meaning that participating companies in MJA3 and MEE covenants are unaware of its existence, the quality of information and the correspondence is to be questioned. It is suggested that the possibility of a "target holiday" is communicated to MJA3 and MEE companies through an information leaflet or by mentioning the mechanism during company visits.

8. Research questions, limitations and validity

In this chapter, the sub-questions and the main research question are answered based on the findings of the desk research, the interviews and the survey. Furthermore the limitations of the research are discussed and its validity.

8.1 Key findings of the sub questions

At the start of this research, sub questions were established that highlight the objective of every part of the research. The answers to these sub questions are relevant to answering the main question:

Which financial facilities should be implemented before 2023 to eliminate the capital barrier of energy efficiency and by doing so, improving energy efficiency in the industry and unlocking its potential?

In the following text, the sub questions are answered based on the findings obtained from desk research, from the interviews and of the survey.

Energy efficiency

- What are the barriers withholding energy efficiency?

Various articles have been written on the barriers of energy efficiency. According to Sorrell et al. 2011 the barriers can be categorised into six groups: Risk, imperfect information, Hidden costs - hidden potential, access to capital, split incentives and bounded rationality. This research focuses on the access to capital barrier, this barrier is the main topic in the interviews.

- What research has been done on the capital barrier?

Practical research on energy efficiency has not been performed yet. In 2015 a research performed by ECN followed the same approach, seven interviews were conducted in an attempt to understand the social aspect of energy efficiency. Three conclusions were deduced from the results; expertise at the company is favourable to implement measures, energy management has a positive influence and internal stimuli are leading when taking investment decisions (Brunsting et al., 2015). The findings of this research correspond to the findings of this study and complement each other.

Financial management

- Which financial instruments are already in place?

The Dutch energy (efficiency) policy consists of several regulatory frameworks, arrangements and subsidies. To reach the nationally set goals, additional instruments would be beneficial. Furthermore, it is stated in the Energy agreement that it would facilitate instruments for energy efficiency in the industry. No instruments, except for the EIA, have been implemented. Several existing financial instruments can be identified such as a bank loan, subordinated loan, financial/operational lease, energy performance contracting, tax incentives, subsidies and private equity. Aside from these existing instruments, participating companies opted for creative arrangements and instruments. Some of the existing financial instruments are included in the survey to determine its effectiveness as well as potential financial instruments that follow from the interviews.

Interviews – Technology suppliers

- What kind of solutions have technology suppliers come up with themselves?

The interview with the technology suppliers resulted in valuable insights. Three solutions were voiced which are applied to be able to sell more equipment. These solutions are: rent-buy construction, ESCo constructions and financial/operational lease. Of these solutions, the rent-buy construction displayed the most potential. All three solutions are included in the survey.

Interviews – End-users

- What are the barriers withholding business cases with a payback period of two to five years from implementation?

From the interviews it is concluded that there are projects of various sizes and investment amounts which are not implemented. These projects have a payback period of two to five years and are nonetheless economically and environmentally interesting for implementation. Several justifications were provided as to why these projects are still on hold. The payback period is too long (>3yrs), there is a lack of budget, there is no enforcement and there is no sense of urgency.

- Which elements of a financial instrument are of importance?

During the interviews with the end-users, the interviewees were asked to rank elements of a financial instrument. The goal; to discover which elements are decisive when making an investment decision. The following elements were identified as being important: On-/off-balance, guarantees, duration of the contract, performance guarantees, subsidies and the administrative burden. It was specified that there is a preference for off-balance financing schemes. These are however difficult to establish.

Follow-up survey

- Which financial instruments would be effective?

The results of the survey are promising. Aside from indicating which financial instruments would be effective, it also provided insight to the effectiveness and the boundary conditions of the company. A majority of the instruments were deemed effective. These are: an ESCO, operational lease, rent-buy construction, government guarantee, (revolving) fund, investment subsidy, energy efficiency subsidy and a target holiday. Although these instruments sound promising, more research should be conducted to determine the boundary conditions and if the instrument can be used within existing (regulatory) frameworks. The main drivers that determined the success of an instrument are risk mitigation, certainty and reducing payback periods.

8.2 Main research question

With the answers of the sub-questions, the main research question can be answered which is:

Which financial facilities should be implemented before 2023 to eliminate the capital barrier of energy efficiency and by doing so, improving energy efficiency in the industry and unlocking its potential?

Based on the interviews with the technology suppliers, end-users and the survey it can be deduced that there are several instruments which show potential to be implemented for energy efficiency in the industry. These are the ESCo construction, rent-buy construction, subordinated

loan, guarantees, subsidies, operational lease and an energy efficiency investment fund. Companies have a slight preference for off-balance arrangements, this element is a determinant when observing the likelihood of success of an instrument. An ESCo construction and an operational lease are considered to be successful. This is however subject to change with altered accounting standards from 2019 on which may limit the success of these two instruments. The rent-buy construction is also perceived as a suitable instrument. However, as indicated during an interview with a technology supplier, this construction is a fairly new mechanism that has not been implemented on a wide-scale yet. The juridical aspects of the solution are furthermore disputable and the scalability of this solution is restricted as the balance sheet of the supplier is limited. The remaining four instruments can be combined and it is proposed to introduce a fund which dispenses subordinated loans, subsidies and guarantees. To reach national set sustainability goals, to incorporate institutional investors and to unlock the potential of energy efficiency in the industry, this is acknowledged to be the most suitable solution with a long-term prospect. The fund will focus on industrial energy efficiency projects that should be linked to a risk assessment tool to standardize the diversity of projects.

8.3 Limitations

Several limitations can be identified that influence the results of this research. These limitations exist as the focus group is relatively small, five technology suppliers and sixteen end-users, through which it is difficult to find a golden mean that is representative for the industry. With only twenty one interviewed companies, the results of this research are not representative.

The target group for this research is based on one prerequisite; only companies that participate in the MJA3 or MEE covenant can take part in this research. Aside from this condition, no other boundary conditions were introduced. The interviewee for this research is not selected based on position, which has resulted in interviewing people with different positions, from energy manager to the CEO. A manager may have a different point of view than the CEO of a company, which may also influence the answers provided during the interview and on the survey. Although the interviewees occupy different positions, all are experienced and knowledgeable on the topic of this research. Due to the nature of this research, an exploratory study, the difference in positions is irrelevant.

The interviewed companies operate in different dynamic markets. In figure 17 it can be observed that the sixteen interviewed companies are active in five different sectors. Every sector has its own dynamics, their own business models and can therefore not be compared to each other. For example, a company active in the steel industry has different objectives and experiences different dynamics than a company active in the chemical industry. Even within a sector or industry, companies experience different dynamics (e.g. chemical company producing a commodity product versus a chemical company that produces customer-specific products). Because of these differences, it is difficult to compare the interviewed companies. This also explains why one solution or financial instrument would be effective for one company and ineffective for the other.

The last limitation is the possibility of a lack of financial knowledge. It cannot be assumed that an engineer is knowledgeable regarding financial instruments and investment decisions if this is not his main activity. A CEO of a company is in the possession of much more understanding regarding financial instruments and mechanisms than a project or energy manager.

Furthermore the CEO of a company will provide other answers regarding investment decisions, as he is the decision-maker, than managers. This imbalance of knowledge may have had an effect on the results of this research.

8.4 Validity

Following from the remark made regarding an imbalance of financial knowledge, this also questions the validity of the research. Interviewees may have different understandings of certain concepts which affects their answers. This not only concerns knowledge on financial instruments, but also concepts such as sustainability, low hanging fruit and strategic decisions. The answers provided are also strongly influenced by the reasoning of the interviewer and the descriptions provided. As an example, end-users are asked to rank the element 'performance guarantee' in the list of financial elements. This element can be understood in two ways, the company providing a performance guarantee to a company or the company demanding it. Although it is attempted to indicate the boundary conditions of this element (should be understood as receiving performance guarantee), it could be the case that the interviewed company understood the element differently.

The use of the payback period as a capital budgeting method presents another discussion that could question the validity of the research. In chapter 2.2.2 multiple disadvantages of this method are presented. The main disadvantages are that the time value of money is not taken into account and that it does not incorporate any profits or cash inflows after the estimated payback period. Thus there is a possibility that the payback periods shared by the technology suppliers and the end-users are inaccurate. This also means that the argument provided by companies to not implement projects, that the payback period is too long, can be irrelevant. Although the payback periods are inaccurate, this does not alter the findings and observation obtained during the interviews and from the survey.

9. Conclusion and recommendations

Based on the findings, results and observations, several key conclusions can be identified that summarise the results of the interviews and survey. After the key conclusions, recommendations are presented for further research and action.

9.1 Key conclusions

The data analysis consisted of three separate parts; the interviews with the technology suppliers, the interviews with the end-users and the survey with financial instruments. Due to the exploratory nature of this study several key conclusions can be identified. The key conclusions are listed below in the form of an enumeration for ease of understanding.

- In this study, sixteen end-users were interviewed that mentioned twenty eight projects which have a payback period of two to five years. This demonstrates that there is an enormous potential of projects in this category (payback period 2-5 years) that are not implemented. Through these projects The Netherlands can realize CO_2 reduction in a much more cost-effective approach compared to investments in renewable energy sources. Investments in energy efficiency in the industry would have sizeable environmental effects and it would aid in reaching nationally set sustainability goals in a profitable manner.
- The projects are contextual and there is no 'one size fits all' solution. Financing industrial energy efficiency projects is different than financing wind parks where the same model can be applied multiple times. Where a wind park comes with closed boundary conditions and as a stand-alone unit, investment projects in the industry are integrated into the process. This means that for an instrument to be most effective, it should be custom-made to the companies' needs and fitting in existing frameworks (e.g. compliant to accounting standards).
- There is a slight preference for off-balance arrangements; companies are reluctant for a negative influence on their financial ratios. Based on the observations made during the interviews with the end-users and comments made in the survey, it can be concluded that on-/off-balance is a decisive element when making an investment decision. Although companies prefer off-balance, these arrangements (e.g. operational lease, ESCo construction) are challenging to establish and to maintain as it is dependent on the ownership of equipment and risk. Furthermore is it expected to be more complex in the near future due to changing accounting standards from 2019 onwards.
- Companies that are closer to the consumer in the supply chain accept longer payback periods for sustainability projects and/or specifically evaluate the sustainability component of a project. Examples were shared where payback periods of six to eight years are acceptable; sadly this was an exception and not the norm. The same can be observed for projects that are perceived as strategic investments where longer payback periods are deemed acceptable by the company.
- Through the absence of effective enforcement companies do not experience a sense of urgency. Specifically, there is no effective enforcement of the Wet Milieubeheer which results in projects with a payback period of less than five years being set aside. On this note, there are however also companies that comply to the regulations from an intrinsic motivation. These companies willingly categorise investment projects that should be implemented according to regulation eventhough enforcement is absent.

- The Dutch government is not perceived as a fitting partner to discuss energy related obstacles with, the main reason for this claim is a lack of knowledge and expertise. Furthermore, it is mentioned that the Belgian and German government are more suitable conversation partners. Expertise is present in The Netherlands at the executive governmental level, it is therefore recommended that officers of RVO collaborate with regional officers when performing company visits.
- A lack of capital is one of the reasons projects are not implemented. From the interviews with the end-users, it can be concluded that the capital barrier is only experienced by six out of sixteen companies. Ten out of sixteen companies stated that a lack of capital is not the main barrier as they are able to lend money at economically interesting rates.

9.2 Recommendations

The findings and observations of this research provide insights for further exploration. The transition towards a sustainable society and environment is complex, with energy efficiency being an integral part of that transition. To understand the dynamics, more studies should be aimed at various subjects for which several suggestions can be made. The recommendations are presented in the following text.

9.2.1 Risk assessment tool and energy efficiency investment fund

One of the conclusions of this study is the observation that there are multiple projects in the industry set aside with a payback period of two to five years. These projects can achieve a CO_2 reduction in a relatively short time period in a profitable manner. Incentives and attractive arrangements are needed to implement these projects to realize the long-term benefits of energy efficiency that can assist in reaching national sustainability targets. At the start of this study it was stated that capital should be linked to industrial efficiency projects and that currently these parties are unable to find each other on common ground. From a financial perspective, several hurdles can be identified as to why capital is not used to finance industrial energy efficiency projects:

- The projects are contextual, thus customization is needed,
- Financial costs coupled with customization of projects is relatively high caused by overhead costs,
- Energy efficiency projects in the industry are incorporated in the process. This is different than wind farms or solar parks which are stand-alone components where clear boundary conditions can be identified,
- A lack of knowledge results in ignorance,
- Difficulties in evaluating the risk and success factor
- Varying investment amounts ranging from 30,000 to 70 million Euros. Financing parties like to invest in projects of 100 million Euros and up.

To overcome these obstacles, a risk assessment tool is suggested to standardize the evaluation procedure and to overcome the language barrier between financial parties and the industry. With the risk assessment tool, projects are assembled and are given a rating based on various elements. In figure 19, the potential projects were portrayed in groups according to their respective investment amount. It is suggested that the same method is applied for the risk assessment tool where projects are categorized into three divisions: investments from €100,000 – 1 mln, from €1mln – 10 mln and €10 mln and up. This division is anticipated to be constructive as it will increase standardization, projects will be easier to cluster and it will

decrease the overhead costs. After all, projects of 10 million Euros should be evaluated differently than projects of around 200,000 Euros. The projects are assessed based on various elements such as:

- technology risk,
- operating risk,
- environmental risk,
- company risk,
- payback period of the project.

Based on these elements, a credit rating is issued (e.g. A^+, A, B). The assessment also includes an average default rate and the assessment costs. Institutional investors like to invest in projects with an investment of 100 million Euros and more. By doing this, the overhead costs are low. In the case of energy efficiency in the industry, there are multiple projects of varying investment amounts which (when combined) accumulate to a high investment. Although technical experts assess these projects, there remains a chance of default. With a wide scale implementation of this tool and with a large amount of projects, this default is covered by the other successes through which the approach remains profitable. Nonetheless to provide insight for the funder in terms of the success factor of the project, an average default rate will be provided.

It is recommended that technical experts perform the technical risk assessment. In this approach, the risk assessment is performed by parties with experience and knowledge which will strengthen the reliability of the tool. The assessments costs are to be paid by the funder and are therefore included in the listing, establishing an economic system where all stakeholders are benefited. An example of the listing can be observed in table 3.

	€ 100,000 – 1 mln	€ 1 mln – 10 mln	€ 10mln >
Credit rating			
Average default rate (%)			
Assessment cost (€)			

Table 3 Technical risk assessment listing

Based on the survey and the positive answers during the interviews with the end-users, a fund is proposed as a central instrument to finance energy efficiency projects. The fund is perceived as a suitable instrument to link institutional investors to energy efficiency project efficiently and to make industrial projects more accessible An energy efficiency investment fund is proposed as multiple (different) stakeholders can be assembled to set up this mechanism. The fund will take the form of a public private partnership (PPP) where the government is included, for trust and security, in combination with private parties such as banks and pension funds. The fund can be revolving, meaning that the periodic pay-backs of the loans by the companies are used to finance other projects in turn. From a company's perspective, it is irrelevant if this fund is revolving or not. For this reason, the revolving aspect of the fund is set aside from this discussion. Further research should be done to investigate if the revolving element would be an added benefit or not.

The fund is observed to be most effective when used in combination with the risk assessment tool, where the risk assessment tool serves as a means of translation between industrial projects and funding provided by institutional investors. To increase the likelihood of success, the government is included to increase trust and to provide possible guarantees. Furthermore, the introduction of the fund also aids in reaching national sustainability goals. The fund can be used for various purposes, ideally it is used for financing projects in the form of a subordinated loan, subsidies or providing guarantees. In figure 54, a visualisation can be observed where the risk assessment tool is combined with the investment fund. Companies present interesting sustainability projects which are assessed with the aid of the risk assessment tool. The risk assessment tool develops the credit ratings and provides a listing of relevant information the funder will need to know and/or will be interested in (see table 3).

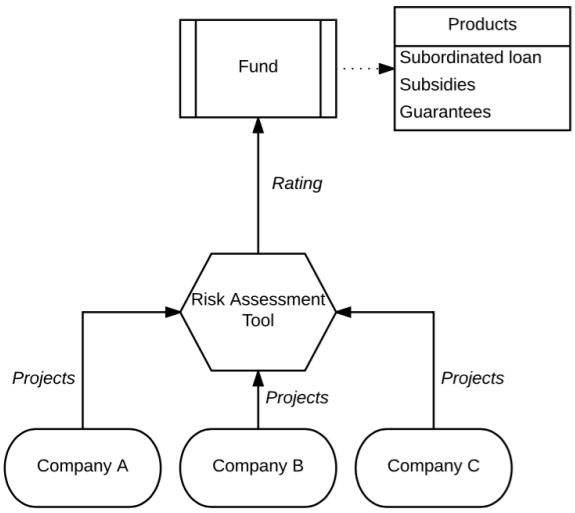


Figure 54 Combining risk assessment tool and fund

After the projects are assessed, the investment fund will be utilized as a central instrument to arrange the funding of the industrial projects. Institutional investors will provide the capital for the investment fund and the loans are paid back as stated in pre-agreed terms. Based on the result of the data analysis, the length of the loan should be coupled to the payback period of the project and it is preferred that the paybacks are flexible. This means that the lender will have the option to pay back more in good years. A subordinated loan is perceived as a loan combined with a high amount of risk as this loan is subordinated to other loans. This means that in the event of a bankruptcy, this loan is paid back at the very last. A subordinated loan may therefore be combined with an additional risk premium on top of the interest rate. This affair was introduced during the interviews with the end-users and was acknowledged as being understandable. This observation is a positive detail and increases the chances of success of implementing a subordinated loan as a product of the investment fund. In figure 55, the construction of an energy efficiency investment fund is portrayed with institutional investors providing capital to the fund and the fund financing the industrial projects. The government guarantee in this figure is portrayed with an intermittent arrow as it is optional and not a prerequisite for the fund to exist.

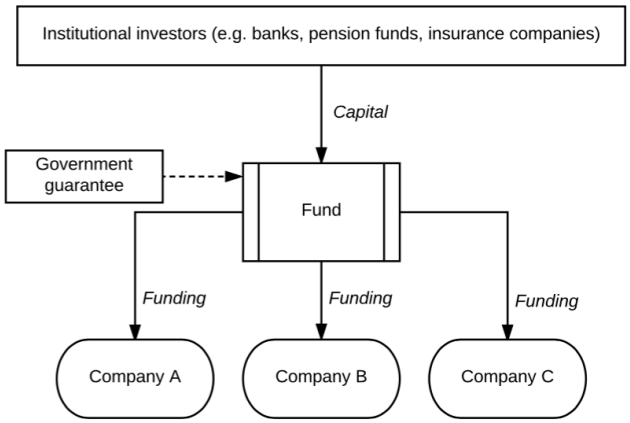


Figure 55 Energy efficiency investment fund

The potential and possibilities to develop the risk assessment tool in combination with the investment fund should be explored further. It is advised that these mechanisms are developed in cooperation with the various stakeholders. In such a way, all parties are aware of its goal and development increasing understanding and trust.

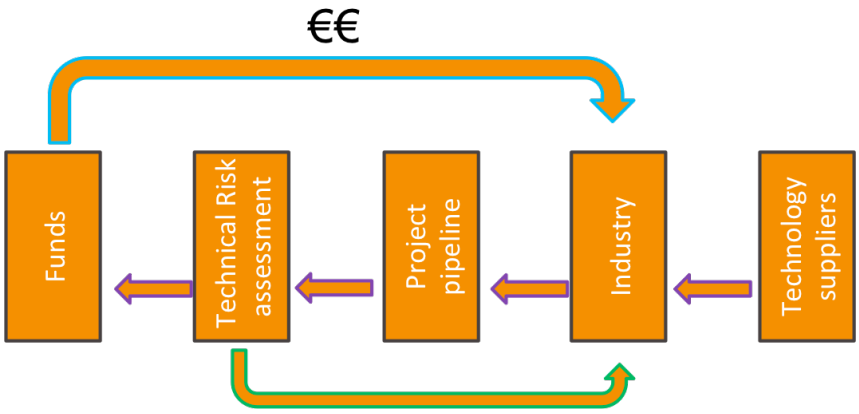


Figure 56 Portraying the chain of finance and projects

In figure 56, the essential elements in the finance chain are portrayed in a simple overview. It is a concluding synopsis summarising figure 54 and 55 with the inclusion of the technology supplier. The blue upper arrow indicates a capital stream from the fund to the company to implement the project. The green lower arrow indicates a feedback loop and an exchange of knowledge between the stakeholder performing the technical risk assessment and the owner of the industrial project. More research should be done to investigate the potential of both mechanisms and its implementation before 2023.

9.2.2 Combining officers of RVO and regional enforcers

It is observed that there is no efficient or effective enforcement. This negatively influences the investment categorization at a company; more projects could be implemented, especially by companies participating in the MJA3 covenant. This could be achieved by efficient and effective enforcement which will result in companies experiencing a sense of urgency. It is expected that this will affect the internal investment categorization where sustainability projects are moved up the ladder (to category compliance). Aside from inadequate enforcement, a perceived lack of knowledge on all governmental levels by the industry is coupled with negative effects. From a company's point of view, the government is not recognized as a trustworthy and credible partner. This is regrettable as knowledge is present in The Netherlands, but not implemented effectively.

To realize impact on a short term it is of importance that the knowledge gap between government and industry is decreased and that enforcement is effectively carried out. It is therefore recommended that the knowledge and expertise at RVO is utilized to reinforce regulation. To have a productive conversion about drawbacks, technical risks and potential of industrial projects it is essential that parties at both ends are adequately knowledgeable to create a level playing field. Currently, regional officers who visit companies are not knowledgeable regarding industrial processes. This results in imbalanced ineffective conversations where companies do not perceive the government as a credible partner. More knowledge is needed if the industry is expected to perceive the government as a meaningful partner. By linking officers of RVO to regional officers for company visits, productive and effective conversations will take place as all conversation parties are on the same level of understanding. There will be a transfer of knowledge, increased understanding and the government will have a better overview on the industry as a sector.

9.2.3 New business models

During the data collection and data analysis of the interviews it became apparent that a shift is observed in the use of energy efficient equipment. The ownership of the equipment is becoming less important where the focus is on the use of the equipment. A relevant example of this observation is the rent-buy construction offered by one of the technology suppliers. In this construction the equipment is rented to the end-user and the equipment is included on the balance sheet of the technology supplier. After negotiations, this was perceived as the most suitable solution for both parties. The use of the equipment is perceived as the focal point of this arrangement and it is expected that more agreements of this sort will be implemented. The interviewed technology suppliers, and some end-users, agreed to the statement that future arrangements will focus on the use of the equipment with the aspect of ownership becoming less important.

It is recommended that the industry, especially technology suppliers, set its course towards the development of new business models where the savings are offered to the client instead of the equipment. This will be in line with expected future development where a shift in focus is anticipated. With accounting standards becoming more stringent, creative solutions are essential to implement projects with potential whilst satisfying the needs of the client. Mechanisms such as an ESCo construction, where the focus is on the energy savings and not on the equipment, should be further explored and developed.

Additionally, the industry should change from taking a defensive stance to positioning themselves as partners. Companies can assist in reaching nationally set sustainability goals by implementing projects that have a positive effect on the environment. With an "I help you, you help me" mentality, more partnerships between government and industry can be established that will result in a win-win situation for both parties. With the current perception of the government by the industry, suitable leaders should be selected to lead the way and "best practice examples should be shared. The leaders should moreover be knowledgeable regarding technical complexities and have the social skills to properly convey messages and converse with the government. This will result in an increase of understanding and trust from both sides (industry and government, executive level) and proliferation of knowledge.

9.2.4 Further research

This study is exploratory and various subjects were touched upon. The findings can be used to continue research from other viewpoints and focusing on alternative target groups. In this study, employees of varying positions are interviewed from an energy and sustainability manager to a CEO of a company. For the continuation of this study, it would be interesting to interview chief financial officers of a company. Their influence on the investment decision may be consequential and decisive. By understanding the problem from multiple angles, solutions can be proposed which are to be expected to be effective as it takes into consideration multiple perspectives.

Likewise in this research, there was no specific focus on one category or sector. For future explorations, it would be fruitful to focus on specific target groups (e.g. per sector/same-sized companies/per covenant). This could lead to representative results and more insight as to what kind of financial instruments would be effective for a specific group. Furthermore is it recommended that more research is done on the internal categorization of projects, including the cultural aspect of companies. This could increase understanding as to why projects with a payback period of two to five years are not implemented and what measure could change strict internal boundary conditions (e.g. payback period >3 years not accepted).

Another aspect that should be further researched is the categorization of sustainability projects and the inclusion of a sustainability ranking. With many end-users stating that the low hanging fruit has been implemented already, it is not realistic to evaluate sustainability projects similarly to regular investment projects as sustainability projects are coupled with longer payback periods. This requires a change in approaching investment projects and changing the way of thinking. Instead of valuing a project solely in terms of capital budgeting methods and financial ratios, they should be evaluated based on sustainability methods such as life cycle analysis, material flow analysis, impact on the environment and resource management.

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Appendix A

Final list of questions – technology suppliers

Technologieën

1. Jullie bieden technologieën aan die energy efficiency zouden verbeteren, maar bedrijven gaan meestal toch voor het vertrouwde en nemen niet de meest efficiënte technologie. Wat zijn jullie verkoopargumenten om de klant te overtuigen?
2. Komen klanten zelf met de vraag?
3. Bieden jullie een garantie aan voor als het product minder uitvalt?
    a. Financieel risico in verband met vermindering van productkwaliteit?

Financiering

1. Waar lopen jullie tegen aan bij het aanbieden van producten?
2. Waar hebben jullie klanten behoefte aan?
3. Wat zou jullie helpen om meer producten te kunnen aanbieden?
4. Voor bedrijven is financiering een voorname reden dat project weerhoudt, jullie bieden de klanten zelf een oplossing aan om die barrière te overbruggen. Zou u daar maar wat over kunnen vertellen?
5. Hoe reageren klanten daarop?
    a. Is het een standaardoplossing die aan elke klant wordt voorgesteld?
    b. Wat zijn de randvoorwaarden voor deze oplossing?
    (Een bepaalde terugverdientijd? Hoogte investering?)
6. Wat zou je nodig hebben om de oplossing op te schalen?
7. Waarom zien klanten er vanaf?
8. Zie je een trend waarbij het meer gaat om gebruik dan om bezit?
9. Los van de oplossing, wat voor oplossingen heeft u nog meer voor ogen?

Slot

1. Ik ga langs eindgebruikers voor een interview, zijn er nog vragen die jullie inzicht zou kunnen bieden zodat jullie meer producten zouden kunnen verkopen?
2. Hebben jullie contacten waarbij dit spelt? Zouden wij daar in contact mee kunnen komen?

Appendix B

Final list of questions – end-users

Context
Korte introductie van onze achtergronden en doel van het onderzoek.

Introductie

1. Kunt u in het kort vertellen wat uw bedrijf doet, wat zijn missie is en wat uw rol is in deze organisatie?
2. Is energie efficiency (EE) een onderwerp dat speelt binnen uw bedrijf en uw sector?
    a. Hoeveel mensen in uw bedrijf houden zich bezig met EE full-time en part-time?
    b. Waar worden zij op beoordeeld?
3. Wat zijn uw jaarlijkse gemiddelde energiekosten en hoeveel procent is dat van de totale productiekosten?
4. Hoe worden investeringsprojecten gecategoriseerd binnen uw bedrijf?
    a. Wat is het proces van idee naar operationele implementatie?
    b. Hoe vaak wordt dit proces doorlopen en hoe lang duurt het?

Cases

1. U heeft een business case voor energiebesparing liggen met een terugverdientijd van 2-5 jaar,die op de plank blijft kunt u daar wat meer over vertellen?
    a. Wat voor type investering? *(strategisch, efficiency, dwang etc)*
    b. Terugverdientijd?
    c. Zijn er andere voordelen dan alleen energiebesparing? (Verwerkt in TvT?)
    d. Duur (tijd)?
    e. Productiestop?
    f. Andere nadelen, belemmeringen?
2. Om welke redenen wordt dit project niet uitgevoerd? *(Geld? Gebrek aan personeel/kennis? Gebrek aan tijd? Geen ondersteuning vanuit management?)*
    a. Hoe verloopt hier het besluitvormingsproces?
    b. Wat zijn hier de overwegingen tot besluitvorming, op welke laag loopt het vast?
3. *Als het gerangschikt wordt als een core-business investering of een strategische investering, wordt TvT dan minder van belang dan als het een utility investering zou zijn?*
4. Wat we nu zien is dat investeringsprojecten met een terugverdientijd van 1-2 jaar over het algemeen wel uitgevoerd worden. Voor projecten, met een terugverdientijd van 2-5 jaar, is dit lastiger. Van leden horen we vaak dat er wordt vastgehouden aan een terugverdientijd van maximaal 2 jaar, terwijl projecten met een terugverdientijd van maximaal 5 jaar economisch en financieel ook interessant zijn.
    a. Wat is voor u een criterium voor maximale terugverdientijd voor energy efficiency projecten en waarom?
    b. Wat is er in uw bedrijf nodig denkt u om projecten met een langere TvT dan 2jr te implementeren?
    c. Zou u daar een voorstander van zijn?
    d. Wat doet u er aan om dit te realiseren?

Financiering

In de literatuur worden verschillende barrières genoemd die energiebesparingsprojecten weerhouden van implementatie. Tot nu, zijn de belemmeringen enkel beschreven in literatuur, maar concrete acties missen vooralsnog. Dit onderzoek richt zich op de kapitaal barrière, en graag zouden we daarmee meer de diepte in willen gaan.

1. Bestaat er in uw optiek een mismatch tussen de financieringsbehoefte voor energiebesparende projecten met een TvT tussen 2-5 jaar en het beschikbare financieringsaanbod/financieringsinstrumentarium?
    a. Kost het u moeite om projecten gefinancierd te krijgen?
       Zo ja, waar schuilt in uw ogen de grootste bottleneck?
2. Hoe financiert uw bedrijf zich? → Hoe is die verdeeld in percentages, dus hoeveel procent van banken, obligaties, van leden, grote aandeelhouders etc)
3. Wat zijn van elke financieringsbron de criteria voor investeringen en financiering?
4. Is er een voorkeur voor interne of externe financiering?
    a. Waarom (het een boven de ander)?
    b. Maakt uw onderneming momenteel gebruik van externe financieringsvormen? Zo ja, kunt u mij vertellen welk type (risicodragend vermogen, vreemd vermogen) financieringen dat zijn?
5. Is er een voorkeur voor on- of off-balance financiering?
    a. Waarom (het een boven de ander)?
    b. Wat zijn de afwegingen en de voor- of nadelen?
6. Heeft u een voorkeur voor financiering via eigen vermogen of vreemd vermogen en wat zijn uw overwegingen?
7. *Zijn jullie bereid om lange termijn partnerships aan te gaan met bijvoorbeeld een technische dienstverlener, die jullie kan ontzorgen zodat er meer op het core-process geconcentreerd kan worden?*
    a. *Zo nee, waarom?*
    b. *Zo ja, waarom en wat levert het op?*
        i. *Kunt u een voorbeeld noemen van een partij waarmee u langer dan 5 jaar een contract mee heeft?*

8. Met dit onderzoek willen we graag helpen passende financieringsoplossingen te ontwikkelen zodat meer projecten daadwerkelijk uitgevoerd kunnen worden. Om dat te doen, is het van groot belang dat de voorkeuren van de eindgebruiker in kaart worden gebracht. **(Laten zien: opzet plaatje met financieringen).** Ons initiële aanpak was het voorstellen van verschillende financieringsvormen om de kijken wat het meest passend is. We waren begonnen met het in kaart brengen van verschillende financieringsinstrumenten en vormen, dat is al een hele waslijst. Gaandeweg tijdens het uitwerken van die instrumenten, merkten we dat de devils in de details zit. Er zijn zoveel verschillende vormen waar net dit of net anders is, en dat maakt dit vraagstuk erg lastig. Als antwoord daarop besloten we om de vraag om te keren en bedachten we ons, waar heeft de industrie eigenlijk behoefte aan? Tenslotte, uw onderneming is degene die de projecten en uit zal voeren. Dus kort samengevat wat is onze vraag aan u: wat zijn belangrijke kenmerken aan een financiering waar uw bedrijf waarde aan hecht? De kenmerken zetten we op een waarderingsschaal en kijken na alle interviews of er een patroon inzit. .

Ik heb hier een lijst met een aantal financieringscondities. Zou u deze condities kunnen waarderen op een schaal van 1-5, waarbij 5 het meest van toepassing is en 1 het minst van toepassing. (Korte uitleg bij elke conditie)

➔ Bij elke conditie een toelichting voor keuze vragen en de randvoorwaarden (probeer zoveel mogelijk samen met de gesprekspartner een intstrument te ontwerpen; "we zouden investeren als de overheid …, de leverancier …, etc.")

On-balance/off-balance = Is het voor uw onderneming van belang of de financiering on- of off-balance is? Kunt u omcirkelen waar uw voorkeur naar uitgaat?

Zekerheidsstelling = Als zekerheid voor de financier, kan het vragen om zekerheidsstelling. In een geval van een project zal dat waarschijnlijk het project zelf zijn. Zou dit meespelen in de beslissing om gebruik te maken van financiering?

Looptijd financiering = Voor welke termijn zou u indien nodig kapitaal aan willen trekken in maanden/jaren?

Rentevoet en risico opslag = Hebben jullie intern een regel mbt de hoogte van het rendement? En zouden jullie akkoord gaan met een risico-opslag zodat het risico voor de financier afgedekt is?

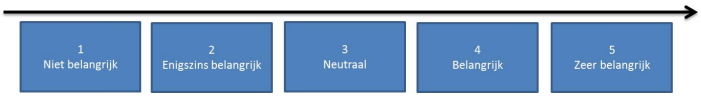
(Prestatie)garanties = een voorbeeld. In de utility sfeer, als je kijkt naar een ESCO constructie levert de ESCO een bepaalde hoeveelheid stoom/schoon water en wij garanderen dit of dat. Er zijn sommige bedrijven waarbij als een bepaalde hoeveelheid niet wordt geleverd, dat hun core-process negatief wordt beïnvloed.

Delen van besparing met financier = Hoe kijken jullie tegenover het delen van de besparing met de financier? En als je denkt aan een ESCO constructie, als er meer wordt bespaard dat dat gedeeld wordt met de ESCO, zouden jullie daarmee akkoord gaan?

Variabele aflossing = flexibele financiering, bijvoorbeeld het ene jaar meer en het andere jaar minder.

Subsidies
Fiscale voordelen

Administratieve lasten = De hoeveelheid administratieve lasten, weegt dat mee in jullie beslissing?



Conditie	1	2	3	4	5
On-balance / Off-balance	☐	☐	☐	☐	☐
Zekerheidsstelling (recht op onderpand)	☐	☐	☐	☐	☐
Looptijd financiering	☐	☐	☐	☐	☐
Rentevoet en risico opslag	☐	☐	☐	☐	☐
(Prestatie)garanties	☐	☐	☐	☐	☐
Delen van besparing met financier	☐	☐	☐	☐	☐
Variabele aflossing	☐	☐	☐	☐	☐
Subsidies	☐	☐	☐	☐	☐
Fiscale voordelen (bijv. EIA)	☐	☐	☐	☐	☐
Administratieve lasten	☐	☐	☐	☐	☐

9. 1 van de ideeën is een apart fonds opzetten waar geld inzit dat ge-earmarked is voor industrial efficiency projecten, zou u dan meer projecten kunnen doen?
10. Geen incentive om investeringen naar voren te halen, terwijl dat milieu technisch beter is en je hebt er ook langer profijt van. Wat voor incentive zou helpen denkt u?
    a. Hoe kijkt u in dat kader tegen verscherping van de wet- en regelgeving?
11. Als speler in deze markt, heeft u zelf een andere oplossing voor ogen om meer projecten (die een positief effect zou hebben op energiebesparing) uit te kunnen voeren?
12. Hartekreet?

Appendix C

Mail to technology suppliers

Investeringen in industriële energiebesparing met een terugverdientijd tussen de twee en vijf jaar zijn – vanuit economisch- en maatschappelijk oogpunt – door hun typisch hoge winstmarges zeer rendabel. Toch halen veel investeringsvoorstellen de eindstreep niet. Dit heeft verschillende oorzaken, met als meest voorkomende reden: financiering.

Een terugverdientijd van twee tot vijf jaar is, zeker voor (institutionele) beleggers, uit het oogpunt van te behalen financieel rendement bijzonder interessant en kan op redelijke korte termijn veel impact hebben op CO2 reductie. Er is dus sprake van een mismatch tussen rendabele industriële besparingsprojecten en kapitaal waardoor kansen voor verduurzaming blijven liggen. Een verduurzaming die goed is voor de concurrentiepositie van de energie-intensieve industrie, goed voor het milieu en aantrekkelijk voor (institutionele) beleggers.

FME wil met een onderzoek naar verschillende cases de belangrijkste (financiële) barrières identificeren die bedrijven ervan weerhouden om deze projecten te implementeren. Hiervoor willen wij graag diverse business cases bestuderen om met de uitkomsten passende oplossingen voor financiering te helpen ontwikkelen. Daarmee willen we een brug slaan tussen industrie en kapitaal met als resultaat dat meer projecten daadwerkelijk kunnen worden uitgevoerd.

Voor dit onderzoek zijn wij op zoek naar energiebesparende projecten in de industrie met een terugverdientijd van 2 tot 5 jaar die om verschillende redenen op de plank blijven liggen. Wij vragen u om cases ter beschikking te stellen. Deze projectcases worden geanonimiseerd verwerkt, waarbij enkel de bevindingen worden gebruikt.

<u>Achtergrond</u>

De industrie in Nederland is de grootste eindgebruiker van energie, met ongeveer 35% van het nationale energieverbruik. Als grootste finale eindgebruiker van energie kan de industrie door besparingen een forse impact hebben op de verbetering van haar concurrentiepositie en de vermindering van de uitstoot van broeikasgassen.

De huidige energiebesparingen in de industrie liggen gemiddeld tussen de 1,3 en 1,5 % per jaar. Dit is voornamelijk een gevolg van de uitvoering van de MJA en MEE convenanten, de Europese EED richtlijnen en de 1:1 afspraken uit het Energieakkoord. Los van deze verplichte besparingen, is er nog veel potentie om de energy efficiency in de industrie te verbeteren. Toch leert de ervaring dat dit maar mondjesmaat gebeurt.

Energy efficiency projecten komen niet of onvoldoende van de grond om verschillende redenen; het valt buiten het jaarlijkse budget, het heeft geen prioriteit of de Return on Investment is meer dan twee jaar. Door verschillende beperkingen worden projecten met veel potentie niet uitgevoerd, die juist vanuit een maatschappelijk, economisch en ecologisch perspectief erg interessant zijn.

De financiële barrière is volgens veel betrokkenen een voorname reden die implementatie tegenhoudt, terwijl projecten met een terugverdientijd van twee tot vijf jaar economisch gezien erg interessant zijn. (Institutionele) beleggers zouden kunnen investeren in vrijwel risicoloze (groene) besparingsprojecten met een terugverdientijd van tussen de twee en vijf jaar en daarmee interessante rendementen behalen. Bovendien zijn deze terugverdientijden aanzienlijk korter dan investeringen in duurzame energie uit zon en wind.

Onderzoek

Dit onderzoek wil de mismatch tussen industrie en (institutioneel) kapitaal adresseren en overbruggen. Dit gebeurt o.a. door het analyseren van de bedrijfsspecifieke cases om de belemmeringen in kaart te brengen, het aggregeren van die bevindingen, het ontwikkelen van innovatieve financieringsinstrumenten, financieringsschema's en fondsen die een brug kunnen slaan tussen vraag en aanbod. Dit met als insteek een positieve impuls te geven aan milieu, economie en industrie, en daarmee energie efficiency in Nederland en daarbuiten tot een investeerbare markt te maken.

Voor vele bedrijven is financiering een belangrijke belemmeringsfactor, en dit onderzoek zal zich om die reden voornamelijk daarop concentreren. Het onderzoek wordt uitgevoerd door, Kimberley Tjon-Ka-Jie, student masterfase aan de TU Delft, die in de vorm van interviews en literatuurstudie de belemmeringen zal identificeren. Alle informatie zal strikt vertrouwelijk worden behandeld en niet te herleiden zijn op een enkele bedrijfssituatie.

De aanpak en uitkomsten van het onderzoek worden afgestemd met lopende initiatieven vanuit het Energieakkoord. Bedrijven die cases aandragen zullen ook de beschikking krijgen over de (geanonimiseerde) resultaten van het onderzoek.

Wij zullen u binnenkort telefonisch benaderen om uw medewerking te vragen aan dit onderzoek.

Appendix D

Mail to end-users

Geachte [op achternaam],

Mijn naam is Kimberley en ik zit in de laatste fase van de Master Industrial Ecology aan de TU Delft – Universiteit Leiden.
Ik ben werkzaam bij FME als stagiaire, de ondernemersorganisatie voor de technologische industrie.
Onze organisatie bundelt de belangen van ruim 2.300 bedrijven waarvan er zo'n 400 actief zijn in de energietechnologie.
Dit betreft technologieën voor zowel (duurzame) opwekking, distributie, opslag en efficiency van energie.

Op dit moment doen we onderzoek naar de financieringsvormen van industriële investeringsprojecten met een terugverdientijd tussen de 2 en 5 jaar.
De praktijk leert dat dit type projecten vaak blijft liggen terwijl dit vanuit economisch- en duurzaamheids- perspectief opmerkelijk is.
Met ons onderzoek willen we de ontwikkeling van financieringsinstrumenten stimuleren die passend zijn voor de grote variëteit aan bedrijfsspecifieke situaties.
Het onderzoek wordt uitgevoerd in nauwe samenwerking met Prof. Kornelis Blok en Dr. Zenlin Roosenboom-Kwee van de TU Delft.

Mijn vraag is: bent u bereid een uur van uw tijd vrij te maken om hierover met mij van gedachten te wisselen in de vorm van een (telefonisch) interview?
Uw reactie zie ik met belangstelling tegemoet.

Met vriendelijke groet,

Kimberley Tjon-Ka-Jie
Stagiaire Energie en CleanTech

Appendix E

Outcome interview technology suppliers

Response	Explanation
Energy savings	Saving energy
CO2 savings	Reducing CO2 emissions
Reducing costs	Reducing costs on a yearly basis
Transparency	Transparency from the supplier towards the customer
Efficiency (equipment)	Efficient equipment
Unburdening	Unburdening of the customer in such a way that the customer can focus on its core business
Sustainability	Improving sustainability
Exemplary role	Being an example for other companies
Move opex to capex	Opex investments can be used for capex investments so that the customer can focus more on its core business
Equipment can be recouped	Equipment can be recouped on its own, compared to other equipment in the same market
Improve quality	Improve the quality of the processes and of the company

Explanation of the response categories

Appendix F

List of financial instruments – survey

Instrument	Description	Advantages	Disadvantages
Energy performance contract (overall and contract energy management)	ESCo (Energy Service Company) responsible for performance risk and credit risk. As ESCO is responsible for funding and performance. If bank financing is used as a third party, bank receives the rights to the stream of payments as security for the loan. Can also be applied only for commodities where the output (steam, heating/cooling) is sold to the customer at an agreed price.	No upfront investment needed No knowledge or extra personnel needed Return on investment guaranteed Service and maintenance done by ESCO Guaranteed energy savings Lower operational costs Custom-made advice and application Energy efficient equipment Reduce risk of plant failure	Built on a relationship of trust (can take a long time to establish) ESCO may have access to confidential information Total amount of payments exceeds the investments done by ESCO Additional savings are shared with ESCO Dependent on ESCO for energy commodities
Financial lease	Lessee is the owner of the equipment/system and pays back a pre-agreed amount every month	Leasing period equivalent to the economical service life of the product, can be accounted as long term assets	Knowledge on equipment/installation in-house needed Service and maintenance responsibility of lessee
Operational lease	Lessor is the owner of the equipment/system and lessee pays back a pre-agreed amount every month	No upfront investment needed Service and maintenance responsibility of supplier After leasing period, equipment/system can be changed Economical risk of equipment after lease responsibility of lessor Off-balance	Equipment is part of the process, which makes it difficult to remove
Rent-buy construction	A construction where the technology supplier remains the owner of the asset and maintains it, the company pays an amount for use monthly as rent.	No upfront investment needed Service and maintenance responsibility of supplier	Equipment on balance sheet of the supplier Not judicially sound yet Wide –scale

	After the contract period, the asset can be taken over by the client, agreements can be made regarding this transaction. The asset does not have to be included on the balance sheet, until the ownership is transferred to the company	Equipment is transferred to the client after contract period Risks impaired with the technology is responsibility of the supplier Off-balance	implementation not possible (yet) due to limited balance sheet supplier
Government guarantee	A bank or investor provided a loan to finance the asset. A guarantee from the government to pay back the loan could help in lowering the risks for both the company and the bank/investor, and to cover the unpredictable component of return. It could lower the threshold when making an investment decision and stimulates the implementation of projects where uncertainty is an influential barrier.	Decreases risk and uncertainty Increases trust May be used as an incentive to implement projects Can reduce interest rates Increase attractiveness of implementing radical innovations	Expertise needed for allocation Risks must be managed and correctly mapped Guarantees should not be allocated to risks that stakeholders can manage themselves
Energy efficiency investment fund	The introduction of a (revolving) fund which contains capital from banks, government and/or institutional investors. The capital is earmarked for energy efficiency projects and can be lend at below market interest rates. The company repays the fund in pre-agreed terms, from which the capital can be deployed again to finance other energy efficiency projects.	Dedicated to energy efficiency investing Increases accessibility for institutional investors to invest in industrial projects Can be combined with existing financial instruments (guarantees, subsidies, subordinated loans) May influence a companies' environmental policy regarding energy efficiency Attractive to SRI investors	Expertise needed for the allocation of funds The projects should be profitable for investors Challenging to align the goals of institutional investors and companies
Investment subsidy	Capital provided by the government to help an industry, technology or business. Subsidy can be received as compensation for the inevitable losses/unprofitable component of the investment.	Increases the likelihood of success Unprofitable measures are given a chance to develop and grow Positively influences the PB, IRR or NPV	The subsidized measure may become dependent of the subsidy Clouded profitability Not taken into account in the decision making process due to

		May act as an incentive to invest	administrative barriers
Subsidy for energy efficiency	A mechanism, such as the SDE+ for renewable energy, for energy efficiency where you will receive subsidy as compensation for the unpredictable component of retun / inevitable losses of your investment.	May act as an incentive to invest Positively influences the PB, IRR or NPV Existing mechanisms (SDE+) is used, industry is familiar	What is compulsory by law for companies, cannot be subsidized. May therefore not be applicable to projects with a payback period of 2-5 yrs. Expertise needed to evaluate projects
Private equity and venture capital	Investing in early-stage and expansion-stage energy efficiency companies, which are not stock listed, and projects with the potential for substantial capital appreciation. The investor often partners with other specific funds and strategic investors to provide additional equity funding to the investment.	Can be accounted as equity, increasing credibility (and solvency) Gives unlisted companies the opportunity to grow Company can make use of the knowledge brought in by the investor	Comes with ownership Partnership for a long term
Subordinated loan	A subordinated loan issued by the public sector or investors. In times of bankruptcy, a subordinated loan is revoked last. The length of the loan can be agreed upon, as well as the payment schedule.	Showcases trust as the loan is subordinated to other loans Off-balance	Expertise needed for implementation Lack of "best practice examples" Due to risks and uncertainty for the financing parties, the interest rate may contain a risk premium.
Target holiday	Currently, there is no incentive to advance projects (which are in reality scheduled at a later period in a companies' planning). This incentive entails that if you implement a project that has a significant energy efficiency improvement, you are exempt from the annual obligatory saving (according to MEE/MJA3 covenant) for the years that follow.	May act as an incentive to implement projects earlier than planned Benefits of the project are gained earlier than planned Exempt from annual obligatory savings (MJA3/MEE)	Not possible due to scheduled maintenance plans

Source: (Taylor et al., 2008)(Bertoldi & Rezessy, 2005) (Buonicore, 2012) (Thumann & Woodroof, 2009) (Eefig, 2015) (Woodroof & Thumann, 2013) (Irwin, 2007)

Appendix G

Summary of the interviews with the technology suppliers

	Technology supplier A	**Technology supplier B**	**Technology supplier C**	**Technology supplier D**	**Technology supplier E**
Verkoop argumenten	Energiebesparing (harde euro's), zuiniger, praten in tonnen CO2	Ontzorgen, verplaatsen capex naar opex voor klant, vergroenen, besparen, transparantie	Besparing en systemen die zichzelf kunnen terugverdienen	Ontzorgen, duurzaamheid, CO2 besparing, voorbeeldfunctie naar andere bedrijven	Ontzorgen, verbeteren kwaliteit van processen en bedrijfsvoering. Afgeleide doelstellingen: energieverbuik/materiaalverbruik/grondstoffenverbruik
Reden afhaken klant?	Ontwijkend gedrag, te druk of prioriteiten liggen anders.	Klanten beginnen langzaam te bewegen van standaard tender processen naar 1:1 oplossingen, dit leidt vaker tot een opdracht en tot uitvoering	TvT te lang, grens van klant ligt bij 2-3 jaar. Financiering. Hassle.	TvT te lang	Heeft niet met coreprocess te maken, het is nice to have/imago. EnergyInside is een relatief nieuwe werkwijze, financiering is nog niet als barriere voorgekomen.
Eigen ervaringen	Energie is te goedkoop, energiebesparing in relatie tot totale kosten is klein, maar in relatie met de waarde van het apparaat groot (TCO = 15% investering, 15% onderhoud, 70% energie)	Steeds meer partijen stoppen de capex liever helemaal in het coreprocess	Projecten blijven hangen op TvT en long-term commitment. Niet op financiering. TvT voor strategische investeringen geen harde eis. Er is geen incentive om die overige rendabele investeringen naar voren te trekken.	Als TvT langer dan 2-3 jaar is dan is er geen discussie over financiering meer, maar discussie over TvT. >4jr geen case.	Bij de industrie is kennis nodig om veranderingen door te voeren, TvT speelt nog geen rol omdat ze met het laaghangend fruit beginnen. Het bedrijf financiert zelf niet ivm principiële keuze.
Eigen oplossing	Klant betaalt 3 jaar huur, TvT apparaat is 2 jaar, het apparaat blijft van leverancier. Er is een gentleman's agreement dat hij na 3 jaar voor 0 euro wordt verkocht, maar dit staat niet in het contract ivm de balanspositie. Product staat op balans van	ESCo, volledig designen, bouwen, onderhouden en financieren van de ondersteunende asset. Leverancier financiert de investering, klant gaat voor x periode een contract aan. Voorkeur om de eigenaar te zijn van de asset inclusief afspraken over opstalrecht	Werken samen met een broker (3.8/3.9% rente) en bieden financieringsconstructies met installatie aan → financial lease. Als ze niet inhaken op financial lease, dan full operational lease om het off-balance te maken.	Lease aanbieden in samenwerking met een bedrijf, uiteindelijk besluit de klant om het toch zelf te financieren. Financiering was dan geen barrière meer, maar projecten werden dan makkelijker uitgesteld.	Nieuw programma waarbij de klant advies krijgt over hoe er energie bespaard kan worden, beginnend met het laaghangend fruit

	leverancier en financiert voor. Huur en niet lease, off-balance.	waar de installatie komt te staan (huur/koop).			
Standaard oplossing?	Nee. Balans van leverancier is niet oneindig. Externe financiering mogelijk, maar interne financiering is goedkoper. Om op te schalen, private financieringscons tructies nodig die tussen klant en bedrijf zit → nadeel is kennis barrière. Je moet naar een shared-risk-reward model toe. Samen ondernemen, partnermodel.	Ja. Het bedrijf is een kapitaalkrachtig bedrijf met een groot investeringsbudget en heeft geen probleem met opschalen.	Nee, samenwerking met externe equity partner zou interessant zijn.	Nee, het uitwerken van een ESCo-achtige constructie zou interessant zijn, alleen zal daarbij zelf geïnvesteerd moeten worden in meetapparatuur. Apparatuur verhuren geen optie, geen kapitaal voor investering beschikbaar (start-up)	Ja, maar staat nog in kinderschoenen.
Standaard oplossing of maatwerk?	Maatwerk	Inmiddels standaard basis contract. Mate van risico bepaalt waar het op de balans mag staan, dat is wel maatwerk (on- of off-balance)	Maatwerk	Maatwerk, met deze technologie zit je aan het proces van een klant. Er zit een tijdsbestedingsco mponent aan en technische inschattingskennis.	Voor laaghangend fruit standaard oplossing, voor wat grotere aanpassingen dan wordt het maatwerk
Barrières	Klant is bang voor binding aan leverancier en verlies van vrijheid. Split incentives, klant heeft als eis niet om op TCO te kopen, kennis barrière.	Emotioneel component (bedrijfspolitiek) bij aankaarten mogelijke besparingen. Verlies van werkgelegenheid zou een rol kunnen spelen (de onzichtbare agenda). Dat is in de industrie wat minder een drijfveer → culturele en sociale aspect ook meenemen	Kennis, split incentives, hassle	Geen trackrecord van geslaagde projecten, risico's kunnen door bedrijven niet ingeschat worden.	Kennis over het proces waardoor je geen grote aanpassingen kan voorstellen
Bieden jullie garanties aan?	x	Leveringscontract voor utilities (bijv. stoomcontract)	x	Warmtewisselaar standaard 1 jaar (industriebreed), soms wel	x

				additionele garantie maar staat niet hard in contract	
Waar hebben klanten behoefte aan?	Stacking benefits. Energiebesparing is in elk bedrijf wel een thema, maar of er echt geld in wordt gestopt is de vraag.	Ontzorgen, meer geld voor capex investeringen	Energiebesparing, projecten met TvT 1-3jr	Energiebesparing, CO2 besparing is een add-on	Ontzorgen en energiebesparing
Wat voor oplossing heeft u zelf voor ogen?	Waar leverancier nu naar kijkt is kijken of zo'n energie besparing doorgevoerd kan worden gecombineerd met onderhoudscontracten → richting ESCo energiewinst inventariseren en energiewinst als opbrengst. Meer juridische constructie, klantenbinding, zo verdient leverancier er ook aan en zet zo hopelijk deuren open voor nieuwe kansen. Het wordt dan gebruikt als commercial tool. Kennisverhoging/ kennisoverdracht bij auditors die de energie-audits uitvoeren	Industrial symbiosis, actoren met elkaar verbinden met vraag en aanbod. Net zoals bij windmolens, SDE principe bij windmolens en zonnepanelen ook invoeren voor industriële vergroening.	Meer doen aan handhaving en aan de mindset van bedrijven, geaccepteerde limiet van TvT verhogen van 2-3jr naar 5jr.	Meer dwang, mindset bij bedrijven moet veranderen. Tax incentives.	Kenniscentra, meer bundeling van kennis. Zelf opwekken van energie
Vragen aan eindgebruikers?	Hoe komt er meer vaart in energiebesparing ? Waarom komt een project met tvt 2jr niet van de grond?	Wanneer is de klant bereid om een tvt van 2 jaar los te laten? Wanneer zou de klant ervoor kiezen om een technische dienstverlener hun volledig te laten ontzorgen? En wat denken ze dat dat	Hoe komen we tot een hogere sense of urgency?	Vraag aan I&M: Waar zijn de concrete acties (bijv. COP21)?	Hoe hoog staat het energieverbruik/gebruik op de agenda?

		hun oplevert? Zijn ze bereid om lange termijn partnerships aan te gaan? → kunt u daar een voorbeeld van geven met welke partij u langer dan 5 jaar een contract mee heeft.			

Appendix H

Summary of the interviews with end-users

	End-user A	End-user B	End-user C	End-user D	End-user E	End-user F	End-user G
Kernpunten	Interne doelstellingen hoger gelegd dan bepaald door MEE convenant. Verschillende business cases die blijven liggen door grote risico factoren. (Revolverend) fonds met ge-earmarked kapitaal voor EE zou helpen. Voorkeur voor een capex-subsidie. Er moet vanuit de overheid meer stimulering komen gericht op energiebesparing. EIA helpt niet, is een coöperatie en doelt niet op winst.	EE weegt niet zwaar mee in investeringsbeslissingen. Bedrijf heeft een strak budget en mag geen additionele leningen afsluiten. Voorkeur voor off-balance instrumenten. Pleit voor overheidsgaranties om risico's af te dekken. Geen kapitaal probleem.	Wil zich onderscheiden van anderen door CO2 neutraal te worden. Bevindt zich in een traditionele branche waar bedrijfscultuur sterk aanwezig is. Is verplicht om projecten met een TvT van <5jr uit te voeren, maar ervaart geen strikte handhaving. Beperkte investeringsruimte, projecten met een groot besparingspotentieel (investering van 300-400 ton) blijven liggen. Subsidies en fondsen zouden helpen.	Projecten moeten voldoen aan een IRR van 40% om uitgevoerd te worden, ook al is er technologisch laag tot geen risico. Is zeer geïnteresseerd in het concept "green bonds" en is van mening dat een overheidsgarantie steun zou kunnen bieden. Is een voorstander van het revolverend fonds, pleit ervoor dat meer demoprojecten (van nog niet gecommercialiseerde technologie) uitgevoerd moeten worden.	Op het gebied van energiebesparing kan er meer gedaan worden, maar hoeveeltijd tijd en aandacht is beperkt. Met energiebesparing is er geen dwangmiddel, kennis vanuit overheid is beperkt. Bedrijf heeft voldoende kapitaal. Subsidie en een extern fonds voor voorfinanciering zou helpen.	Heeft een aparte categorie duurzaamheidsprojecten waar de TvT langer mag zijn (max 6jr, soms zelf 8-10jr). Heeft op het gebied van energiebesparing geen instrumenten nodig, wel op het gebied van het implementeren van nieuwe technologie. Vraagt flexibiliteit van de overheid op het gebied van subsidies.	Besparing gebaseerd op productie, laaghangend frui it is al gepakt. Financiering niet de main barrier, instrumenten moeten creatiever worden. Het bedrijf financiert liever zelf, maar off-balance constructies zouden wel helpen.
MJA/MEE	MEE	MEE	MJA3	MJA3	MJA3	MEE	MEE
Wet Milieubeheer	-	-	Op de hoogte van deze wet, maar er wordt niet op gehandhaafd	-	Geen handhaving	-	-
Energieverbruik wordt bepaald door	Verwerken van restwater waar nog afvalstoffen in zitten	Elektriciteit (3TWh)	Uitdampen van water	80% stoom, 20% elektriciteit	-	-	Vooral gebruiker van electriciteit (110GW) + 15-18mln m3

							aardgas
Wordt energy efficiency aangemoedigd?	Ja, intern door management (strategie). Doel is 2.5% energiebesparing per jaar en in 5 jaar tijd, 25% minder CO2 uitstoot	Ja, staat hoog op de agenda. Het bedrijf heeft geen investeringen die alleen op EE een fatsoenlijke TvT hebben, EE weegt niet zwaar mee in investeringsbeslissingen, productieverhoging of kwaliteit verbetering zijn beslissende factoren	Doel: CO2 neutraal. Duurzaamheid wordt in de branche gezien als een last, dit bedrijf ziet het als een kans om zich te onderscheiden.	Ja, het liefst worden projecten gedaan die economisch rendabel zijn, los van de verplichte 2%. Interne doelstelling is niet anders dan de verplichte 2%	Ja, corporate milieu verslaggeving met ambitieuze doelen. Er kan meer gedaan worden, hoeveelheid tijd en aandacht is een belemmering. Met energiebesparing is er geen dwangmiddel. Geen handhaving vanuit overheid voor energiebesparende maatregelen	Doel: klimaatneutraal in 2020, het bedrijf gaat verder dan MEE vereisten	Afspraak is dat t.o.v. 2006, 30% bespaard moet zijn in 2020. Minimale doelstelling is gezet door MEE. De besparingen die gerealiseerd moeten worden zijn afhankelijk van productie inzet. Sinds 2006 op schema.
Low hanging fruit	Al gepakt	Al gepakt	Potentie	Al gepakt	Al gepakt	Al gepakt	Al gepakt
Kapitaalbarriere	Ja	Nee	Ja	Ja	Nee	Nee	Niet the main barrier, creatieve oplossingen zouden wel helpen
Rol van de overheid					Overheid kan maar beperkt kennis toevoegen	Op het gebied van energiebesparing niks nodig, voor nieuwe technologie nog wel veel barrières	
Moederbedrijf	Moederbedrijf in Europa	Moederbedrijf in Azie	Moederbedrijf in Europa	Moederbedrijf in Amerika	Moederbedrijf in Europa	Moederbedrijf in Europa	Moederbedrijf in Azie
Hoe worden investeringsprojecten gecategoriseerd binnen uw bedrijf?	1 investeringsbudget voor het hele bedrijf. 1/3 aan vervangingsinvesteringen. Resterend aan dwang-investeringen	4 categorieën: 1. Health and safety, <u>moet</u> 2. Onderhoud sinvesterin	Wet en regelgeving (moet) komt eerst, daarna worden investeringsprojecten gecategoriseerd op urgentie en hebben als	4 categorieën: 1. Safety 2. Milieu (omdat je anders je vergunning	1. Veiligheid en milieu 2. Business gerelateerd (ranking op impact)	1. Veiligheid EE valt onder meerdere categorieeen die afhankelijk zijn van overblijvend	Geen categorisatie. Alle investeringsprojecten worden verzameld en op management niveau wordt

	(ATEX), semi-dwang investeringen (GMP), strategische projecten en rationalisatieprojecten (nice to have, worden gerangschikt op TvT)	gen die productie voortgang bedreigen 3. Strategische investeringen 4. Investeringen die op TvT worden beoordeeld	richtpunt de continuïteit van de bedrijfsvoering, worden niet gerangschikt op TvT.	verliest) 3. Vervangingen 4. Business development (daar valt EE onder)	3. Willekeur Compliance eerst.	budget. Specifieke categorie duurzaamheidsprojecten waar TvT steeds verder opgerekt wordt. Standaardprojecten TvT 2-3jr, duurzaamheidsinvesteringen TvT max 6jr en soms zelf 8-10jr.	besloten hoeveel er geïnvesteerd mag en kan worden. Energiebesparing moet concurreren met andere projecten. Projecten met een TvT >2jr komen er niet doorheen (ivm onzekerheid). In de utility schil worden wel langere TvT geaccepteerd.
Business cases met TvT 2-5 jaar die op de plank blijven liggen	Case 1, electrificatie van de industrie m.b.v. elektrische stoomketel (utilities): TvT 5jr, blijft hangen door onzekerheden en hoge risico-factor	Case 1, verbetering van product kwaliteit (renoveren): TvT mag langer zijn omdat het een strategische investering is, 35mln	Case 1, verhoging gebruik recyclemateriaal: TvT 2-3 jr, 400 ton investering Case 2, verlaging energieverbruik door minder vocht in	Case 1, warmtepomp, TvT 5jr, investering 3-4 mln euro, er kan ¾ mln euro op jaarbasis mee bespaard worden. Technologisch laag tot geen risico.	Case 1, warmte ontrekken uit water, TvT 3-4jr, investering 1.5-2 ton. Wordt niet uitgevoerd omdat het buiten budget valt → als ze voor	Geen business cases als voorbeeld.	Er worden steeds minder projecten opgevoerd, als blijkt dat het project een TvT van 3-5jr heeft wordt hij al afgeschreven.

	Case 2, biogas project (utilities): het bedrijf krijgt het niet rondgerekend Case 3, warmte benutten uit geothermische bronnen (uilities): TvT 4jr, blijft hangen door hoge investering (70 mln), onvoldoende kennis, onzekerheden en hoge risico-factor Case 4, aanpassing van een processtap waardoor minder energie verbruikt wordt (core-business): TvT 4-5jr, wordt uitgevoerd op pilot schaal, kan opgeschaald worden naar meerdere fabrieken. Wordt nu gecategoriseerd als een energy efficiency project, maar kan met stacking benefits hoger gerangschikt worden voor uitvoering. ➔ TvT minder van belang als the benefits	investering Case 2, verbetering van product kwaliteit (vernieuwen):): TvT mag langer zijn omdat het een strategische investering is, 70mln investering Case 3, productieverhoging: TvT onbekend, 3mln investering Case 4, warmteterugwinning: TvT 6-8jr, 15mln investering, blijft hangen door onzekerheden Bedrijf heeft een strak budget en mag geen additionele leningen afsluiten.	grondstof: 350 ton investering. Beperkte investeringsruimte (150 ton), om het bedrijf helemaal op te knappen is 1.5mln nodig. Conservatieve investeerder die geen voorstander is van externe financiering	Case 2, verandering procesinrichting, TvT 5jr, investering 5-10mln, er kan 1.5-2 mln euro per jaar mee bespaard worden. Projecten moeten voldoen aan een IRR van 40% om uitgevoerd te worden. Beide projecten voldoen daar niet aan. Als er na Safety en Milieu maatregelen geld overblijft, wordt er geprefereerd om die uit te geven aan capaciteit uitbreiding en productieverhoging.	dit project gebruik zouden kunnen maken van een speciaal fonds dan zou dat de business case wel positief beïnvloeden. Case 2, slim gebruik van bestaande koelinstallaties, TvT <3jr		Case 1, warmtepomp, TvT 4jr, investering 1.7mln. Door de TvT niet doorgegaan.

	groot zijn						
Lange termijn contracten?	Voor activiteiten buiten core-business (utilities/logistics) wordt er zoveel mogelijk gekeken naar externe partijen, lange termijn contracten is voor het bedrijf geen barrière	-	-	Geen probleem met lange termijn investeringen en (mits off-balance), is momenteel bezig om een utility unit af te splitsen omdat het niet deel is van de core-business	Probeert zoveel mogelijk turnkey te doen omdat het bedrijf niet alle kennis in huis heeft.	Geen probleem, als ze het niet zelf doen dan moet het minimaal kosten neutraal zijn.	Als een bedrijf voorfinanciert (ESCO) en er kan terugbetaald worden uit de besparing leidt dat tot een contractueel probleem met clausules → risico.
Mismatch tussen projecten TvT 2-5jr en financieringsinstrumenten?	Ja. Overheid kan zijn geld beter besteden aan industriële energiebesparing dan aan windmolens en zonnepanelen	Ja. TvT is een issue voor alle investeringen en niet enkel voor EE, categorie TvT 2-5 wordt niet als zodanig herkend.	-	Ja.	-	Hypothese niet van toepassing, projecten met TvT 2-5jr gaan bijna altijd door.	Instrumenten moeten creatiever zijn, er moet een vorm van participatie inzitten.
Voorkeur interne of externe financiering?	Ruimte binnen budget: intern. Buiten budget: **off-balance** externe financiering		Interne financiering	Externe financiering. Bedrijf heeft een gebrek aan capex en heeft daarom een voorkeur voor externe financiering.	Intern, bedrijf heeft voldoende kapitaal	Voorkeur voor intern, bedrijf kan goedkoop kapitaal aantrekken	Bedrijf betaalt de investering liever zelf, maar als er creatieve oplossingen zijn waardoor het niet op de balans komt (betalen uit besparing), dan is dat wel een mogelijkheid.
On-balance / off-balance financiering	5; voorkeur off-balance	5; voorkeur voor off-balance, moeilijk om te bewerkstelligen omdat het risico dan ook bij de leverancier moet liggen.	4; off-balance, dit komt tot nu toe niet voor in het bedrijf	4; off-balance	3; geen voorkeur, geen behoefte aan off-balance financieringen. MAAR als een externe fonds zou voorfinancieren zou dat wel helpen	-	4; Off-balance zou helpen, dan kan het management omzeild worden
Zekerheidsstelling (recht op	4; als de externe financier de installatie	Geen problemen met onderpand, huiverig	3;	2; lage waarschijnlijkheid dat	1; geen issue	-	5; Belangrijk, als ze het apparaat

onderpand)	die hij financiert als onderpand neemt, kan het bedrijf negatief beïnvloed worden als de financier er aanspraak op maakt.	met het verlenen van opstalrecht. Het moet een duidelijk afgebakend onderdeel zijn.		dat zal gebeuren			weghalen stopt het proces.
Garanties	-	5; (overheids)garanties om risico's af te dekken	2; geen garanties nodig om risico's af te dekken omdat het proven technologies zijn	4; doordat de overheid garanties zou geven, zou het bedrijf speciale obligaties (green bonds) uit kunnen geven die specifiek voor EE projecten zijn met een laag rendement omdat er een garantie van de overheid tegenover staat	1; niet van belang	-	4; Is ondergeschikt aan de andere kenmerken, het kan helpen om een duwtje in de goede richting te geven. (soort van SDE op energiebesparing)
Looptijd financiering	5; hangt samen met rendement. Een langere looptijd biedt de financier meer zekerheid	4; <10jr	4; looptijd 2-5jr	3; ongeveer 5jr, project pay-back time gerelateerd	4; 5/6jr, ligt aan ROI. Hangt van het moment en de business case af.	-	4; Groter dan of gelijk aan de TvT.
Rentevoet en risico opslag	5	4; Risicokapitaal (15%), risicoloos kapitaal (2-3%)	-	Cost of capital staat op 15%	- Bedrijf wil zekerheid voor een lange tijd, stabiliteit → vaste rente	-	3; Is onderdeel en ondergeschikt aan looptijd, zekerheidsstelling en garanties. Als dat zwaar invloed heeft op de bovenliggende zaken dan is het belangrijk. Maar op zichzelf staand niet.
(Prestatie) garanties	5; belangrijk bij utilities, bij onder presteren wordt core-	3; minder relevant	5; apparaat van leverancier moet wel leveren, anders wordt	4; het bedrijf zal altijd vragen om een prestatiegarantie. De	4; Leverancier moet garanderen dat hij waarmaakt	-	4; Harde leveringsafspraken omdat het proces

	business negatief beïnvloed		de bedrijfscontinuïteit negatief beïnvloed	leverancier zal het risico wat de gebruiker neemt nooit kunnen afdekken	wat hij beloofd heeft.		anders negatief wordt beïnvloed.
Delen van besparing met financier	-	5; begrip voor de verdeling, maar poging tot zo min mogelijk delen. Bedrijf heeft op dit moment geen ESCO's slechte ervaringen met risico's die niet goed in beeld waren gebracht en scheve risicoverdeling	1;	2; mooi meegenomen, maar geen beslissende factor	1; is mooi meegenomen en een prikkel op lange termijn	-	3; kan helpen om risico te spreiden.
Variabele aflossing	2	5; gekoppeld aan resultaat	4; seizoensgebonden patroon, pas aan het eind van het jaar wordt het duidelijk hoe het bedrijf gedraaid heeft.	1; continu bedrijf, is niet relevant	1; niet van belang, liever constant	-	1; niet van belang
Subsidies	4; voorkeur voor capex-subsidie, dit kan ook helpen om projecten naar voren te halen	3; relatief onbelangrijk	5; niet op de hoogte van subsidies en worden niet meegenomen in de beslissing. Kunnen wel een grote rol gaan spelen, is afhankelijk van de strategie van de aandeelhouder	Geen hoge verwachtingen dat directe subsidies gegeven zullen worden voor investeringen, naar verwachting subsidies in kind (bijvoorbeeld guaranties). Een DEI subsidie zou wel helpen en daar zou het bedrijf meer aan hebben	4; het bedrijf maakt nu gebruik van subsidies, het speelt mee in de investeringsbesliss ing	-	4; Subsidie moet je over de drempel helpen, de onrendabele top overwinnen, maar het moet niet draaien op subsidies omdat dat betekent dat die techniek geen toekomst heeft
Fiscale voordelen	2; EIA heeft geen toegevoegde waarde, bedrijf is een coöperatie en is niet	3; relatief onbelangrijk	5; niet op de hoogte van fiscale voordelen en worden niet meegenomen in de	4; is bevorderlijk en zou helpen, een voorkeur voor mechanismes die niet	4; zou wel een incentive kunnen zijn	-	3; Kan helpen, maar voor een bedrijf in nood draagt een fiscaal voordeel niks

	gericht op winst maken		beslissing. Kunnen wel een grote rol gaan spelen, is afhankelijk van de strategie van de aandeelhouder	op de balance sheet zullen verschijnen			bij
Administratieve lasten	4	5; afhankelijk van grootte	2; bedrijf heeft zijn zaken goed op orde en kan verschillende informatie gemakkelijk aanleveren	1; de besproken investeringsbedragen zijn hoog, overhead kosten daardoor te overzien, zal geen beslissende factor zijn	4; tijd om de business case goed rond te krijgen is vaak niet beschikbaar.	-	4; belangrijk omdat het geen corebusiness is.
Suggestie: revolverend fonds voor energy efficiency projecten	Meer projecten zouden dan uitgevoerd kunnen worden. Moet **off-balance**	Niet relevant, beschikbaarheid van kapitaal niet het probleem, maar de leencapaciteit	Relevant, moeten neutrale fondsen zijn waar geen belangen van andere partijen inzitten. Provincie of overheid	Relevant, maar nuchter over off-balance arrangementen en hoe die off-balance gehouden kunnen worden. Revolverend fonds voor pilot projecten (demo's die nog niet commercieel geïmplementeerd zijn) zou een goede aanwinst zijn	Zou niet helpen. Het bedrijf heeft kapitaal beschikbaar, maar gaat daar in zijn eigen manier mee om. Een off-balance project zal hetzelfde proces doorlopen als een ander investeringsproject.	-	Als daarmee de jaarbalans niet verandert en met de jaarlijkse profit de investering terug betaalt kan worden zou dat een voordeel zijn. Een garantie zou helpen → risico mitigatie, zou een project over de drempel kunnen helpen
Suggestie: investeringssubsidie	Voorkeur voor capex-subsidie, dit kan ook helpen om projecten naar voren te halen. Geen voorkeur voor operationele subsidies (administratieve last)	Zou helpen bij vernieuwings-investeringen door de investeringskosten omlaag te brengen. Eigen suggestie: maak een nationaal plan voor het verduurzamen van de industrie, als je	-	Zou helpen, gebrek aan capex	Een subsidie die trapsgewijs afgebouwd wordt zou helpen. Het kan een prikkel zijn → versnellingspremie	-	Zou helpen. Maar subsidie moet je over de drempel helpen, niet draaien op subsidies

		past in dat plan dan kom je in aanmerking voor een investeringssubsidie					
Investeringen (strategisch/utilities) en terugverdientijden	Langere terugverdientijden acceptabel wanneer het om een strategische investering gaat (product op de markt brengen)	EE as such wordt gezien als een spin-off → drive van de investering is kwaliteit verbetering (strategische investering). EE is een added benefit	-	-	-	Bij utilities kunnen langere TvT geaccepteerd worden. TvT van 2-5jr waar procesoptimalisatie het primaire doel is, wordt wel geaccepteerd.	Een procesverandering zou bij meerdere fabrieken geïmplementeerd worden. Opdracht wordt gegeven vanuit hoofdkantoor, veel onzekerheid
(Eigen) oplossingen	Investeringssubsidie revolverend fonds **off-balance** partij die de investering doet en het product aanbiedt	Financierings garanties en project (variable) garanties voor een periode van ~10jr. Kosten omlaag brengen door risico's af te dekken in de vorm van (overheids)garantie Garanties voor leverancier zodat rente lager wordt (geen/laag risico opslag) en/of garanties aan bedrijf om eventuele verliezen af te dekken. Dit zou ook een goede incentive zijn om projecten naar voren te halen.	Subsidiefonds 1 waarderingssysteem en 1 manier van rapporteren Samenwerkings-verbanden met andere partijen in de keten, meer CO2 besparing en efficiëntere bedrijfsvoering door een betere planning van de werkzaamheden	Het zou geen kwaad kunnen als het overheidsbeleid zo is ingericht dat je vooruit mag lopen op je uiteindelijke doelstellingen Green bonds Revolverend fonds voor demonstratie projecten	Denktank van Masterstudenten om business cases volledig uit te werken	Op het gebied van energiebesparing heeft het bedrijf geen extra maatregelen nodig. Voor het introduceren van nieuwe technologie kan nog wel veel gebeuren.	

Hartekreet	Meer stimulering vanuit de overheid gericht op energiebesparing. Overheid kan meer voor elkaar krijgen met stimuleren dan met eisen stellen. Een afspraak moet van twee kanten komen.	We zijn er in 2050 nog en dan zijn we een groen bedrijf.	Samenwerken!	We komen er met samenwerken.	Company manager stimuleert alle initiatieven. Probeert projecten met een langere TvT te realiseren. Enthousiasme helpt!	Meer flexibiliteit bij de overheid op het gebied van subsidies	TvT 2-5jr is voor een volatiele industrie lang en de markt wordt steeds dynamischer vanaf alle kanten

	End-user H	**End-user I**	**End-user J**	**End-user K**	**End-user L**	**End-user M**	**End-user N**
Kernpunten	Bevindt zich in een zeer competitieve markt en is constant bezig met innoveren. Is bezig met verkenning in de utility schil, zal bij veranderingen in core proces geen externe partij erbij betrekken. Kapitaal is geen probleem, bedrijf kan goedkoop geld lenen. Pleit voor SDE+ subsidie voor energiebesparing en voor (markt) onderzoek naar warmteterugwinning door BV Nederland	Ziet de noodzaak voor introductie van nieuwe technologieën, betrekt hierbij ook concullega's. Pleit voor een achtergestelde leningsstructuur, capex-subsidie en een subsidieregeling voor pilot/demoprojecten (anders dan de DEI). Overheden worden zich ervan bewust dat energie besparen en warmte een aantrekkelijker investeringsgebied is dan alleen zon en wind.	Is bezig met het low hanging fruit intern, veel potentie. Bevindt zich in een zeer onzekere markt, TvT van max 2.5jr worden geaccepteerd. Ziet door de bomen soms het bos niet meer en weet niet bij welk loket er aangeklopt moet worden bij vragen. Heeft geen voorkeur voor on/off-balance financieringen en is op zoek naar instrumenten die de terugverdientijd zouden kunnen verkorten en de drempel verlagen.	Bedrijf zit strak in pak, mag geen additionele leningen meer afsluiten. Off-balance financieringen zijn ten strengste verboden, extern geld is geen oplossing. Subsidies zouden het verschil kunnen maken om projecten los te trekken.	Staat open voor samenwerkingen met technologie-leveranciers en het introduceren van nieuwe technologieën. Pleit voor gesprek met industriepartners op operationeel niveau en een vrijstelling wanneer je in 1x een groot project uitvoert wat een forse energiebesparing met zich meebrengt.	Is van mening dat de industrie zich meer als partner moet opstellen. Ondervindt geen kapitaal barrière. Bedrijf kan goedkoop geld lenen, projecten worden vaak niet uitgevoerd ivm geen capaciteit of omdat het niet in de planning past.	Een bedrijf dat dicht bij de consument staat, dit heeft invloed op de sustainability doelstellingen. Heeft geen strenge eisen rondom financiering. Sustainability investeringen en projecten worden als license to operate gerekend, duurzaamheidsaspect wordt bekeken bij investeringsbeslissingen. Geen kapitaalprobleem, mist stimulans (vanuit overheid).
MJA/MEE	MEE	MEE	MEE	MEE	MJA	MEE	MJA3

Wet Milieubeheer	-	-	-	-	Geen handhaving	-	Door WM zijn die projecten nu onder license to operate geplaatst, maar met de lage energieprijzen kom je niet altijd aan die 5jr TvT. We moeten een voorbeeld nemen aan Belgie/Duitsland, waar er een bonusbeleid en geen sanctiebeleid is. In NL geen drive.
Energieverbruik wordt bepaald door	Water drogen, calcineren, sproeidrogen	95% warmte, 5% electriciteit	Elektriciteit en aardgas	Drogen	Electrificering van de fabrieken	Elektriciteit, gas, stoom. 700mln per jaar uitgave aan energie	40% elektriciteit, 60% warmte
Wordt energy efficiency aangemoedigd?	Wordt aangemoedigd, bevindt zich in een zeer competitieve markt waar 1 euro per kg product besparing interessant is. Geen hogere interne doelstelling dan vastgesteld door convenant, legt wel targets vast waardoor ze vaak boven convenant uitkomen	Energiebesparing staat milieutechnisch en financieel hoog op de agenda. Bezig met bewustzijn op hoog niveau te verhogen *2025 doelstellingen*	Is belangrijk, energiebesparing speelt een belangrijke rol in het verlagen van kosten en CO2 reductie. Er is geen hogere interne target, maar ze komen altijd boven de doelstellingen uit	Is belangrijk, fabriek is de benchmark in Europa. Bedrijf geeft aan dat het steeds moeilijker wordt om 2% per jaar van het convenant te halen. Op branche niveau is 80% CO2 besparing in 2050 als doel gezet.	Belangrijk, heeft in 1x een groot project uitgevoerd waar 30% energie bespaard werd	Staat heel hoog op de agenda en heeft hoge doelstellingen gezet voor het bedrijf. Komt intrinsiek vanuit bedrijf zelf.	In de periode van 2010-2020, 20% groeien zonder extra resources. Kijkt met name intern om energiebesparing te realiseren. Scans op elke locatie gedaan, er kan met “gemak” 25% mindering gerealiseerd worden → nourishing by nature, zuiniger

							omgaan met natuurlijke bronnen. Staat dicht bij de consument, speelt mee in sustainability doelen.
Low hanging fruit	Al gepakt	Al gepakt	Potentie	Al gepakt	Al gepakt	Al gepakt	Veel al gepakt, er is nog potentie op een dieper niveau (planning verbeteren bijv)
Kapitaalbarriere	Nee, kan goedkoop lenen	Ja, krijgt het financiële plaatje niet rond	Ja, instrumenten zouden helpen om meer projecten uit te voeren	Nee, mag niet meer lenen ivm leenplafond	Nee, kan goedkoop lenen	Nee, kan goedkoop lenen	Nee, kan goedkoop lenen maar mist incentives om meer stimulans te krijgen
Rol van de overheid	Investeren in warmteterugwinning	Overheden worden zich er steeds meer van bewust dat energie besparen en warmte een aantrekkelijker investeringsgebied is dan zon en wind. EZ heeft veel juridische en economische kennis, technische kennis mist wat het moeilijk maakt om op techno-economisch gebied met ze te praten	Ondervindt last van de bureaucratische structuur van de overheid, weet vaak niet bij welk loket er aangeklopt moet worden	In gesprek met EZ omdat bedrijf heeft aangegeven geïnteresseerd te zijn in diepe geothermie → aansturing om een pilot project uit te voeren zodat de risico's duidelijker worden	Kennis is gering bij de overheid, heeft daar begrip voor. Overheid zou wel kunnen helpen bij het faciliteren van een gesprek met gelijkwaardige industrieën op operationeel niveau. Doelstellingen in relatie zetten tot een activiteit, meer context.	Op dit moment kan je een open gesprek met de overheid voeren. Presenteren als een win-win situatie waardoor het bedrijf zijn doelstelling haalt en vergroent, en de overheid zijn doelstellingen behaald.	Overheid zou veel stimulerender kunnen zijn en handhaving kan verbeterd worden. Gebrek aan kennis.
Moederbedrijf	Moederbedrijf in Amerika, maar dat maakt niet uit.	Moederbedrijf in Amerika, is deels een belemmering	Moederbedrijf in Europa	Moederbedrijf in Europa	Moederbedrijf in Europa	Moederbedrijf in Europa	Moederbedrijf in Europa

		Tot 10mln mag de site zelf beslissen, anders langs HQ					
Hoe worden investeringsprojecten gecategoriseerd binnen uw bedrijf?	1.License to operate (HSE) 2. Strategische investeringen 3. Kosten gerelateerd	1. Must-do 2. strategische investeringen 3. vervangings-investeringen	1. must-do 2. gebaseerd op TvT, 2jr is acceptabel	1. HSE investeringen (dwang) 2. vervangings-investeringen 3. ranking op TvT (met een focus op kernproduct)	1. veiligheid 2. maintenance 3. efficiency projecten (meer capaciteit of minder kosten)	1. compliance 2. maintenance 3. core-business projecten Probeert projecten met een duurzaamheids-angle meer naar voren te krijgen in de prioritering	1. license to operate (incl. Sustainability investeringen) Per investering wordt gekeken naar duurzaamheids-impact. Budget cyclus per jaar, poging tot 3-jaren plan Duurzaamheidsaspect = energie (1), water (2), waste management (3)
Business cases met TvT 2-5 jaar die op de plank blijven liggen	1. Boilers, TvT 2-3jr. Ziet het bedrijf nog wel gebeuren omdat het apparaat lang meegaat 2. Economizers, TvT 4-5jr. Interessant als je een grootverbruiker bent. Er konden geen specifieke projecten genoemd worden	1. Stoom-recompressie, TvT 3-4jr, investering 0.5-50mln. 2. Industrial symbiosis 3. Warmteopslag 4. Procesverandering → positief schaalbaarheidseffect Bespreekt ook zaken	1. warmteterugwinning, TvT 4-5jr, investering 350.000-1.5mln. Niet uitgevoerd ivm TvT en geen budget. Met kleine projecten van 30.000-40.000 wordt een TvT van 2.5jr geaccepteerd	1. Zelf inzetten van brandstofpellets ipv verkopen, TvT 2-3jr, investering 10-15mln. Is niet direct een project om energie te besparen, maar een besparing op fossiele brandstoffen. TvT kan langer worden ivm volatiele gasprijzen. Aan het core-process verandert er niks.	1. pompen vervangen, TvT 4-5jr. Geen noodzaak, is een kapitaal investering 2. Boilers die aan het eind van de life cycle zijn. Initiële investering is zwaar. TvT 3-4jr is max.	1. indamping van product, TvT 3-5jr. Wordt niet uitgevoerd omdat de capex er niet is qua ruimte, past niet in de planning van onderhoudscyclus en geen capaciteit. TvT <3jr is max.	1. van thermische damp recompressie naar mechanische damp recompressie, 40% reductie energieverbruik. TvT nu op 5-7jr, investering 8mln per indamper. Willen een vervangingsprogramma opzetten.

	Pay-out time van 2-3jr is kantelpunt.	met concullega's → maatschappelijke verantwoording Projecten blijven liggen omdat TvT te lang zijn.		2. Geothermie, investering >100mln. Is onbekend terrein, risico's te groot. 3. Warmenet voor restwarmte, is huiverig voor langjarig contract Projecten met een TvT <3jr, IRR>20% zijn acceptabel. Er is sprake geweest van een langere TvT (3-5jr) voor energie en duurzaamheid, maar dat is weer ingetrokken.			
Lange termijn contracten?	Bezig met verkenning in de utility schil	Momenteel geen ESCO-constructies, niet mogelijk door boekhoudregels	Bevindt zich in een onzekere markt, is geen voorstander van lange termijn contracten	Huiverig omdat het vaak een liability is die op de balans geactiveerd moet worden	Staat er open voor	Staat er open voor, mits de voordelen groot zijn.	Staat er open voor, zie deal met Billfinger
Mismatch tussen projecten TvT 2-5jr en financieringsinstrumenten?	x	Eens	Eens	Eens	Eens. Technologie leveranciers zouden zich meer moeten concentreren op de uitkomst en niet op de technologie	Eens, maar is case-specifiek.	Eens
Voorkeur interne of externe financiering?	X	Interne financiering	Beide worden geaccepteerd, hangt af van de voordelen	Intern, mag niet extra lenen.	Interne financiering, sluit externe financiering en leasecontracten uit.	Interne financiering	Voorkeur voor intern vanuit de cashflow, kan goedkoop geld lenen.

On-balance / off-balance financiering	X	3; off-balance is aantrekkelijk, maar ivm boekhoudregels heel beperkt	3; Geen voorkeur	On-balance	1; On-balance	On-balance, geeft aan dat off-balance moeilijk is	3; Geen harde regel, mag allebei
Zekerheidsstelling (recht op onderpand)	X	3; zou meespelen, maar niet reëel omdat het engineered products zijn	4; Belangrijk omdat het de business kan belemmeren	Niet mogelijk	1; Niet belangrijk	X	3;
Garanties	X	4; belangrijk	5; Belangrijk	Geen beslissende factor, werkt wel mee	5; Heel belangrijk	X	4; Zou helpen
Looptijd financiering	X	4; looptijd gerelateerd aan TvT	5; Belangrijk, gelinkt op TvT	NVT, mag niet	1;	X	4; gelinkt aan normale afschrijftermijn, aan TvT
Rentevoet en risico opslag	X	4; hele afdeling die zich hiermee bezighoudt.	1; Minder belangrijk	NVT, mag niet	1;	X	3
(Prestatie) garanties	X	4; gaan maar tot een bepaald punt. Technische fundamenten en ervaring spelen hierin ook mee.	4; Belangrijk	X	5; Belangrijk	X	5
Delen van besparing met financier	X	3; kan niet ivm boekhoudregels	1; Niet belangrijk, win-win situatie	X	5; Belangrijk	X	4
Variabele aflossing	X	3; rendementsafhankelijk	4; Gelinkt aan resultaat	X	1; Niet belangrijk	X	4; RFC heeft een continu proces maar ivm met goede en slechte jaren zou dit interessant kunnen zijn
Subsidies	X	4; capex subsidie (cash-injectie), geen	5; Zeer belangrijk, kan de TvT positief	4, zou helpen (bijv DEI)	3; Neutraal	X	4; belangrijk

		operationele subsidiering	beïnvloeden				
Fiscale voordelen	X	3; geen beslissende factor, is mooi meegenomen	3; Niet zo belangrijk. EIA bijvoorbeeld is alleen toepasbaar als je winst maakt	4, maakt sinds kort xgebruik van EIA	3; Neutraal	x	4;
Administratieve lasten	X	4; bedrijf zit niet te wachten op extra administratie	4; Belangrijk, financiële afdeling is niet goed bezet	Hangt af van het investeringsbedrag	4; Zo min mogelijk	X	5; belangrijk, moeten niet te hoog zijn
Suggestie: revolverend fonds voor energy efficiency projecten	Zou niet helpen. Bedrijf is kapitaalkrachtig genoeg. Wellicht voor utilities nog wel toepasbaar, voor core proces niet.	Risico aspect is moeilijk De overheid een rendement geven wat beter is dan dat ze op de markt kunnen krijgen om het maatschappelijk aantrekkelijk te maken.	Zou helpen om energiebesparing hoger op de agenda te krijgen en de drempel te verlagen	Zou niet helpen, leenplafond en off-balance is ten strengste verboden	Zou niet helpen omdat het op de balans geactiveerd zou moeten worden	Zou niet helpen, gebrek aan capaciteit of past niet in planning is meer een barrière	Momenteel in gesprek met internationale bedrijven over dit soort leningen. Je wil als bedrijf een statement maken dat je sustainability targets haalt.
Suggestie: investeringssubsidie	-	Zou helpen	Zou helpen	Zou helpen	Zou helpen	Geen beslissende factor	-
Investeringen (strategisch/utilities) en terugverdientijden	-	Technologieën worden integraal met de installatie bekeken. Puur op energiebesparing halen projecten het niet, steuntje in de rug nodig. Bij strategische en grote investeringen worden een langere	Voor strategische investeringen wordt een langere TvT geaccepteerd. Projecten met een TvT van 4jr enkel gebaseerd op energiebesparing is moeilijk te implementeren → beslissing van projecten wordt gedaan op basis van het totaalplaatje	Focus op kernproduct, energiebesparing is een bijvangst.	-	Als het in een gebied zit waarin het bedrijf wil investeren, dan worden langere TvT geaccepteerd.	3 categorieën: TvT 0-3jr, 3-5jr, 5jr>. Projecten rekenen niet rond enkel op EE. Projecten TvT 0-3jr worden uitgevoerd, bij TvT 3-5 jaar zijn het andere elementen die het project naar voren moeten halen

		TvT geaccepteerd. De wereld verandert continu, dat betekent een lagere voorspelbaarheid en dwingt bedrijven ertoe om sneller terug te verdienen					(vervanging/markt verbetering/product-kwaliteitsverbetering)
(Eigen) oplossingen	SDE+ voor energiebesparing	1. achtergestelde lening, off-balance 2. overheidsgarantie 3. subsidieregeling voor demo/pilot project	Beloning in de vorm van een subsidie of een belastingvoordeel	Subsidies zouden het verschil kunnen maken	Als je in 1x een groot project doet, dat je vrijstelling hebt voor de targets voor de daaropvolgende jaren	In gesprek met brancheorganisaties en een ander geluid laten horen.	Boeren krijgen groencertificaten als incentive om te investeren in groene energie Financieel gedreven dus financiele incentives zouden werken Gevoelig voor publieke opinie → zou een stimulans kunnen zijn Deal met Billfinger, RFC koopt energie en energiebesparing, staat NIET op de balans van RFC = operational lease. De regering zou dit soort constructies moeten aanmoedigen.

Hartekreet	Behoefte aan BV Nederland die met goede partners samenwerkt en de mogelijkheden naar warmteterugwinning bekijkt, dan naar kapitaal tegen lage rente.	We moeten stappen gaan maken en het is maatschappelijk belangrijk om het voorop te gaan trekken.	Energiebesparing eerst, breakthrough techcnology komt daarna.		Gewoon doen. We are greater than I.	Bedrijven moeten uit de defensieve modus en zich meer als partner opstellen. Meer leiderschap.	Overheid neem je rol. Zeg wat je doet en doe wat je zegt → betrouwbaarheid

	End-user O	**End-user P**
Kernpunten	Projecten met een TvT van 0-3jr worden uitgevoerd, houdt enkel 10-20% van het investeringsbudget over voor groei/efficiency projecten. Geen interne doelstellingen ivm onvoorspelbare markt rondom energieprijzen. Maximaal gefund, investeringen worden voornamelijk in Amerika gedaan ipv in Europa ivm gasprijzen. Is voorstander van een achtergestelde leningsstructuur, een revolverend fonds en meer overheid-industrie partnerships	Merkt weinig van handhaving en geeft aan dat in België meer specifieke kennis is. Geeft aan dat een hogere energieprijs de beste stimulans zou zijn. Duurzaamheid belangrijk voor green branding, bedrijf heeft geen projecten met TvT 2-5jr die blijven liggen. Gebruikt de EIA en SDE+ subsidie momenteel.
MJA/MEE	MEE	MJA3
Wet Milieubeheer	-	Merken weinig van handhaving

Energieverbruik wordt bepaald door	Samen met Yara verantwoordelijk voor 6-7% van de aardgasconsumptie in NL, 30PJ energieverbruik. 70% van energieverbruik wordt gebruikt om van aardgas kunstmest te maken, 30% wordt gebruikt voor warmte	Wordt bepaald door aardgas, in 10jr tijd van 132 m3 naar 102 m3 per ton gas per ton product
Wordt energy efficiency aangemoedigd?	Duurzaamheid heeft een anker gekregen in bedrijfsstrategie, geen interne doelstellingen opgesteld. Onzekere energieprijzen, is een drive om technologieën of alternatieven te bedenken die kunnen leiden tot een vermindering van energiegebruik	Energiebesparing leidt niet tot meer productie, productiegroei zo efficiënt mogelijk. Energy efficiency wordt wel aangemoedigd, maar productierationalisering heeft nu de focus (meer met minder mankracht). Duurzaamheid wel belangrijk voor green branding en moederbedrijf heeft duurzaamheid hoog in het vaandel staan
Low hanging fruit	Al gepakt	Al gepakt
Kapitaalbarriere	Maximaal gefund, geen additionele (on-balance) leningen mogelijk. Geen kapitaal barrière, geld wordt in Amerika geïnvesteerd i.p.v. in Europa.	Geen kapitaal barrière, subidie helpt altijd, EIA werkt
Rol van de overheid	Meer overheid-industrie samenwerkingen nodig.	Meer specifieke kennis bij instanties in België (BBT –

	Praat met de overheid op alle niveaus (regionaal, RVO, EZ). Geeft aan dat er niks gedaan wordt met de 1:1 afspraken en dat meer handhaving zou kunnen helpen (om het investeringsgeld in Nederland te houden)	Best Beschikbare Technologieën). In Nederland, weinig kennis.
Moederbedrijf	Moederbedrijf in Europa	Moederbedrijf in Europa
Hoe worden investeringsprojecten gecategoriseerd binnen uw bedrijf?	80-90% wordt geinvesteerd in reguliere, verplichte investeringen (turn-arounds). 10-20% blijft over voor groei/efficiency. Geen aparte ranking voor sustainability aspect, voorspelling van CO2 en gasprijs wordt wel meegenomen	1. HSE 2. Klant-eisen (proces kan aangepast worden naar wensen van de klant) 3. Project ranking
Business cases met TvT 2-5 jaar die op de plank blijven liggen	1. Hoger stoomniveau (hogere enthalpy) halen uit technische installaties, investering 2-5 miljoen. 2. Biogas als bron van aardgas, investering 35-70mln TvT 3 jaar is grens, bij TvT 3-5 jaar wordt het al moeilijk	Geen projecten Projecten vereisen specifieke kennis van product en proces waardoor investeringsprojecten beperkt worden door beschikbare resources.
Lange termijn contracten?	x	Momenteel geen ESCO-constructies, niet mogelijk door boekhoudregels

Mismatch tussen projecten TvT 2-5jr en financieringsinstrumenten?	Eens	X
Voorkeur interne of externe financiering?	Extern is geen probleem, mits het geen invloed heeft op financiële ratio's	X
On-balance / off-balance financiering	5; off-balance!	X
Zekerheidsstelling (recht op onderpand)	5; is van belang, bedrijf zal dan minder geld kunnen lenen bij banken	X
Garanties	5; overheidsgarantie zou helpen, bedrijf zal zelf geen garanties kunnen geven	X
Looptijd financiering	1; niet van belang, case by case, gekoppeld aan looptijd financiering	X
Rentevoet en risico opslag	2; marktconform. Geen bezwaar tegen risico-opslag, is onderdeel van de business case	X
(Prestatie) garanties	1; bedrijf geeft geen prestatiegaranties *(geen antwoord op de vraag of prestatiegaranties van belang zijn voor het bedrijf).* Het bedrijf is niet bekend met ESCo constructies	X
Delen van besparing met	3; een moeilijke discussie omdat de	X

financier	oorzaak van de extra besparing moeilijk te bepalen is (vb. door minder productie of door dalende ammoniak prijs?)	
Variabele aflossing	5; graag, meer aflossen in goede jaren	X
Subsidies	1; wordt niet meegenomen in de investeringsbeslissing, is een element van onzekerheid aangezien de toewijzing niet zeker is wanneer het besluit genomen wordt.	X Bedrijf maakt gebruik van EIA en SDE+ subsidie
Fiscale voordelen	1; wordt niet meegenomen bij investeringsbeslissingen	X
Administratieve lasten	1; niet van belang	X
Suggestie: revolverend fonds voor energy efficiency projecten	Positief, zou helpen	X (niet voorgesteld, gesprekspartners leken onvoldoende op de hoogte van financiële mechanismes)
Suggestie: investeringssubsidie	Investeringssubsidie zou helpen, maar het blijft een element van onzekerheid	X (niet voorgesteld, gesprekspartners leken onvoldoende op de hoogte van financiële mechanismes)
Investeringen (strategisch/utilities) en terugverdientijden	x	Langere terugverdientijden geaccepteerd bij strategische projecten

(Eigen) oplossingen	1. achtergestelde lening, off-balance 2. revolverend fonds 3. SDE+ subsidie voor IEE 4. overheidsgaranties (of combinaties) 5. opbrengsten CO2 rechten terugvloeien naar industrie om verbeteringen te doen	Geeft aan dat een hogere energieprijs de beste stimulans zou zijn.
Hartekreet	Wij kunnen als industrie veel meer dan er nu uitkomt en we moeten Europa verder stimuleren tov andere continenten. Meer overheid-industrie.	Geen fossiele brandstoffen en meer innovatie. Warmtepompen en restwarmtegebruik. Energiebedrijven houden infra voor restwarmte tegen.