The future of the Dutch DSO Enexis

Scenario and trend analysis for the role of the Dutch Distribution System Operator in 2030.

ENEXIS
ENERGIE IN GOEDE BANEN

UNIVERSITEIT TWENTE.

The future of the DSO Enexis

A research on the strategic position of the DSO in 2030 using scenario and trend analysis

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Place & Date	Enschede, August 18, 2015

Institute	University of Twente
Faculty	Management & Governance
Program	Business Administration

"After the industrial revolution and the digital revolution, today we are at the dawn of an energy revolution"[1]

[1] Source: PowertothePeople, 2012

Preface

In front of you is my graduation paper, written in fulfilment of my master's degree in Business Administration at the University of Twente in Enschede. After a bachelor in Public Administration I continued my studies with both the Public Administration and the Business Administration master. My choice for doing a second master's program was evident for me; by combining the two fields of study I am able to combine the best of both worlds in my future career.

This thesis then is the product of a combination of my studies. It takes elements from my minor 'Futures: Designing tomorrow's world' and Public Administration master's environmental policy frameworks, whilst keeping a business administration point of view.

My collaboration with Enexis on this research should also be explained. When I began working on this thesis, I had an idea about the effects the energy transition had on consumers or end users and a possible research on this field. It however soon doomed upon me that this would not be a particular interesting research in terms of a Business Administration master's degree. I then reshaped the research towards the perspective of the DSO and the effects of the energy transition on them as central actors on the energy market. This researched featured a scenario analysis based on the 8-step model by Peter Schwartz; it is with this research I approached Enexis at the time that I began with planning interviews. Enexis' strategy manager Frank van Dijck and myself deemed it would be fruitful for me to 'join up' with their project team 'future scenario's', which had started a month earlier and followed nearly exactly the same research method. I became part of the project core team and worked throughout the project on its various stages, contributing and learning where I could.

I think it was the best experience possible and I would not have been able to conclude my education in such a great manner when doing my research alone; working with a team of professionals which have helped me in my work, and I could help with my knowledge was a great way to get to know the practical business and have made me ready to enter the professional labour market.

I would therefore like to offer my sincere gratitude to my manager Frank van Dijck for offering me this opportunity to perform my research in an actual business case; and second to Sander Molenaar for guiding me throughout the process and being my sparring partner in arisen issues and for overall help within the organisation. I would also like to thank all other members of the project team for their input and discussions throughout the process. Their input has been invaluable in the results of this research and their insights have provided me with vast knowledge on the energy sector as a whole, but have also given me many personal learning points to improve.

Enschede, August 18, 2015

Abstract

The current state of the energy market gives lead to this papers research goal. As the future is uncertain, the main goal of this research is an assessment of possible future strategic positions for the Dutch DSO Enexis, and the implications of those positions for the firm. This is done by (1) assessing which trends and driving forces will have an impact on the energy market in 2030; (2) creating four scenario narratives on energy market composition in 2030; and (3) using scenario analysis to analyse the strategic position of Enexis in the energy market and energy network in 2030. This research has followed the linear path laid out by the scenario methodology by Schwartz. The starting point of this thesis is elaborating the current strategic position of Dutch DSO Enexis.

Enexis is a core company of the energy market and energy network; they distribute energy and are the key players to keep the energy flow going. The DSO is the linking factor between energy production and the end user and as such, they are connected to almost any stakeholder within the energy network. The firm operates on both regulated markets and non-regulated markets. For their regulated activities Enexis occupies a monopoly position. Enexis follows a differentiated strategy to get a strategic advantage using their 4 strategic pillars of reliability, affordability, sustainability, and customer focus.

The second phase of this research involved executing an environmental analysis using scenario analysis. This phase begins with identification of trends foreseeable in the near future.

Expert interviews, Delphi workshops, and literature reviews resulted in the identification of 909 trends. These trends have been distilled into 29 trend clusters, which are elaborated in table 5.1-1. Based upon these 29 clusters, two key uncertainties were selected: 'Desire for self-sufficiency' and 'new energy services and service providers'.

Four distinct scenarios have been written based upon the two key uncertainties and all identified trends. The scenarios 'coupled supply', 'together independent', 'everything organised', and 'do-it-yourself' have been created, each depicting a different, but feasible and constructive world. The scenarios are summarized to the right.

Multiple implications were found when comparing the company's business models in each scenario with the current business model. Most notably the cost structure, key resources, and key activities have significant implications.

Each scenario future shows a different role for the DSO Enexis; and also shows a different strategic position. When zooming in on the strategic position of Enexis within each world using the conceptual model by Kim et al., more overlap can be seen. Three out of four scenarios show significant threats to the strategic position in terms of new entrants, substitute products, and bargaining power of buyers. Environmental complexity also rises significantly due to either new services or service providers, or due to increasingly demanding citizens.

This assessment of scenarios then leads to a strategic position for Enexis as energy system operator, a task in which they care for the energy system (regulated or not), and provide, together with market parties, supporting activities to optimize the energy supply. Retaining trust in large institutions like Enexis is also of importance for Enexis; their customer relations ought to be a focus point of the marketing department. Enexis should therefore follow a cost leadership strategy on grid operations, coupled with a focus strategy on advisory activities and market facilitation in order to position the firm as a high quality energy system operator.

Constructed scenario summary

Axes labels

Many new energy services and service providers

No or little desire for self-sufficiency / trust in institutions

Increasing desire for self-sufficiency / no trust in institutions

Coupled Supply

- Consumers have little desire for self-sufficiency and have trust in institutions
- Many new services and service providers
- Europe creates a framework which regional governments implements
- Energy is low-interest for consumers, customers rely on the strength of collaborations between institutions and firms througout the value chain
- The energy mix is decided in regional agreement, heat emerges on large scale as energy carrier
- New grids constrcuted in public-private collaborations; new grid ownership at market parties
- Transport sector is electric due to government stimuli

Together independent

- Consumers have a desire for self-sufficiency
- Many new services and service providers
- Many innovative firs are active in the liberal energy market
- Competition on distribuion market; low voltage grids handed out in concession, new grids constructed by market parties
- High and medium voltage grids remain property of regulated DSOs
- Cooperations focus on total care of local communities (integrating, energy, health care, transport, etc)
- Customers choose local energy solutions
- The gas network is no longer automatically replaced at end of life

Everything arranged

- Consumers have little desire for self-sufficiency and have trust in institutions
- Few new services and service providers
- European and national governments enact strong policies
- Consumers show low involvement and trust governments and institutions enable a functional society
- One national DSO for electric, gas, and heat grids
- Gas and heat used together
- Large scale heat grids constructed
- Low amount of cooperations; energy suppliers and municipalities fill that need
- Strong growth in electric transport; required infrastructure constructed and funded by the national DSO

Do-it-yourself

- Consumers have a desire for self-sufficiency
- Few new services and service providers
- Consumers take control and search for their own, local solutions
- People share knowledge and products via (online) communities
- Limited regulation aimed at a basic energy system and security
- DSO maintains a backup function and powering industries, revenue based on government funding without support for socialised costs
- Large diversity of local solutions by customers
- The gas network is no longer automatically replaced at end of life

Few new energy services and service providers

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List of figures and tables

Project team members

Bold members are core team members

Frank van Dijck	**Manager Strategy**
Kirsten van Gorkum	**Senior advisor strategy**
Sander Molenaar	**Senior advisor strategy**
Gertjan Mulder	**Innovator**
Marijn Renting	**Innovator**
Michel de Vries	**External: Jester**
Roland Bakker	Senior strategy designer
Lotte Breunesse	Manager Market facilitation
Mariska van den Broek	Head planning & reporting
Jan Paul Buijs	Manager IT policy
Michiel van Dam	Innovator
Sybe bij de Leij	Innovator
Jeroen Sanders	Manager Fudura Duurzaam
Han Slootweg	Manager EBS (Expertise, Bedrijfsvoering & Stations)
Else Veldman	Manager Innovatie
Bianca Wezenberg	Manager HR Business partners


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1 Introduction

Chapter I – Introduction

"After the industrial revolution and the digital revolution, today we are at the dawn of an energy revolution" (VPRO Tegenlicht, 2012).

Distribution System Operators (DSOs) and Energy companies are facing an enormous challenge today, as more and more consumers are choosing to locally generate their own electricity. This shift to locally produced energy poses many difficulties to not only the grid itself on a technical level, but also on a social level as the relation between consumers and companies active on the energy market is changing.

Where presently all stakeholders are more or less isolated entities with a specialised function (the DSOs maintain the grid, energy companies sell and sometimes produce energy, and consumers consume energy), roles are shifting towards a more networked approach in which companies share resources and services and consumers are included in the production process. Energy suppliers want to be able to buy 'prosumer' energy surplus, while DSOs need to handle this new two-way exchange of energy. Meanwhile, energy service companies (ESCOs) and Other Service Providers (OSPs) are emerging with a business case to take care of the entire energy infrastructure of their customers and provide services based on smart metering. Previous roles of companies are not suited for this new situation, making a transition inevitable – all the while new start-ups are gaining grounds in offering new innovative technologies to use.

The future of the energy market then is by no means linear and clear-cut – a future study to identify leading trends, driving forces, and their implications, is needed.

1.1 Background

This research sets against a global change due to increased technological progress and a more 'free' notion of the buying and selling on the consumer energy market. The European Union as a supranational organisation has initiated policies in order to fulfil three major energy efficiency goals by the year 2020: 20 % increase in renewable energy, 20% increase in energy efficiency, and 20% reduction of greenhouse gasses compared to 1990 (European Commission, 2013) (Notenboom, et al., 2012).; many western European countries have adopted these EU policies. The energy market is a significant part of these targets and has to change radically in order to both meet the goals set by the EU and to facilitate renewable energy sources as successors of fossil fuels.

In the Netherlands the energy market has been government owned and controlled until 2001 (Cassatieblog.nl, 2013). In 1998 the European Union imposed all member states that the energy market should be a liberal market to enforce a 'free exchange of capital, goods, services and people within the European Union' (Energieprijzen.nl, 2014) through the guideline 2009/72/EG (Europa.eu, 2010). In the Netherlands a pilot started in 2001 with choice of electricity supplier and in 2004 the market was opened and consumers had choice of energy supplier. The regulation is implemented and enforces by two authorities: the Ministry of Economic Affairs and the Energy chamber (part of the NMa) (Enexis, 2012).

The current Dutch energy market is comprised of energy generation, distribution, and selling as depicted in figure 1.1-3 (Enexis, 2012). The most important distinction that can be made is between regulated and unregulated markets. Due to the importance of the transmission and distribution energy grids, these markets are regulated by law. The production and supply markets are unregulated to support free market principles and a low price for consumers. A Dutch graphical example by 'Netbeheer Nederland' is included in appendix a.

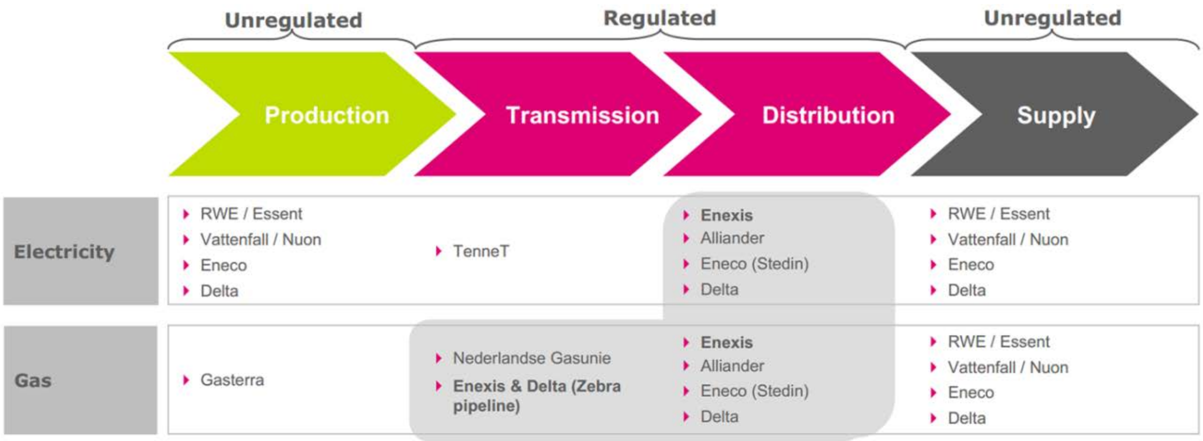

Figure 1.1-3: The Dutch energy value chain
Source: Enexis (2012, p. 15)

1.1.1 Energy production

Energy producers lie at the beginning of the energy market and function as primary suppliers. Most companies involved in generation energy (both electricity and gas, but mostly for electricity) are also found in the energy supplier category, selling their own supply of energy. There are a total of 73 electrical power generation stations in the Netherlands currently, owned by 16 companies[2].

1.1.2 Energy transmission

The high voltage maintenance company TenneT is responsible for the national high voltage main grid while Gasunie Transport Services is responsible for the main gas transport grid (Gasunie transport services, 2015). These transmission system operators (TSOs) balance the national grid to make sure no overloads happen nor regions where the power goes down due to shortage, and also maintain international connections to transfer energy internationally.

1.1.3 Energy distribution

Distribution system operators (DSOs) (together with TSOs) are the backbone of the energy market – building and maintaining the infrastructure in place to transport energy. There are a total of 9 DSOs which operate regional energy grids[3]. These firms mainly operate the grid from the national transmission grid to the meter at the end user, but are also engaged in market-wide pilots in order to create a future proof energy system.

1.1.4 Energy supply

In the Netherlands more than 30 energy suppliers are active in selling energy to end users[4]. The five largest energy suppliers possess 80% of the energy market in the Netherlands (Vereniging Eigen Huis, 2013); making them strong and important stakeholders in the energy market. Some energy suppliers also span the value chain by producing energy. Most energy suppliers are currently affiliated to the association for energy suppliers Energie Nederland (Energie Nederland, 2014).

1.1.5 Niche and new markets

The energy market is a relatively new market with many niches available for profit-seeking firms. Niche firms then mostly resolve around single innovations, like new types of solar panels, wind

[2] See appendix B
[3] See appendix C
[4] See appendix D

turbine farms, earth heat pumps and so on – innovations to increase energy efficiency or reduce energy usage. Also in this category are new firms which can be classified as Energy Service Companies (ESCOs). These companies offer solutions based upon IT system integrations in the energy market. Firms can effectively outsource the energy supply and corresponding energy management of their (office) buildings to energy service companies (ESCOs) with the purpose of "substantially reduce energy costs, increase quality, and reduce stress on own personnel" (Esconetwerk, 2015).

Other service providers (OSPs) are firms which offer 'smart' services based upon smart metering and energy management solutions for both consumers and business clients. More and more OSPs are finding their way on the market making it a growing market.

Advisory companies are also abundant on the consumer energy market. The professional association Fedec represents 173 independent energy advisors alone (Fedec, 2014). Most of these companies are nothing more than freelancers, but also some larger companies are represented by Fedec. A second professional association in the semi-public sector is the foundation 'Stichting EPA Consultants Nederland'. It works closely with the 'Rijksdienst voor Ondernement Nederland', and offers consultancy on a wide array of issues, focussing on sustainability and innovation (Stichting EPA Consultants Nederland, 2014).

More and more companies who operate in adjacent markets are also involving themselves on the energy market; for example IKEA which has started selling solar panels (IKEA, 2015).

1.1.6 Energy consumption

Consumers have increased bargaining power on the energy market, as they are increasingly generating their own energy and/or are mobile in switching energy supplier. Consumer contact is therefore an increasingly important factor for not only energy suppliers in order to increase keep customers, but also for DSOs in terms of type of connection / meters. These relations between DSOs and consumers are however minimized in the current market model (Molenaar, 2015). Consumers are also increasingly joining up in collaborations and local initiatives to pursue their energy goals. (Hanssen & de Vriend, 2013).

1.2 Current energy market

This traditional model of the market is changing today. No longer is the distribution of energy (electricity) a one-way delivery; it is becoming an two-way flow with consumers generating their own energy using (for example) solar panels and selling their energy surplus back to energy companies – via the DSOs energy grid. While the DSOs core resources (assets) will never be threatened as they lie at the heart of the energy market, their core activities however are shifting; getting the distribution network 'futureproof' to facilitate this two-way flow requires a new approach with new activities, setting the DSO seemingly on an intermediating change trajectory. The transition towards a sustainable energy grid is characterized by fragile relationships with customers due to the innovativeness of the market activities. Firms on an intermediating change trajectory can enhance their position putting themselves in the shoes of both supplier's and buyer's and assess which new options are emerging (McGahan, 2004).

In reaction to consumers generating their own energy, the government has initiated with policy concerning the energy exchange of consumers, calling it 'salderen' (Energieoverheid, 2013), effectively a tax-friendly way to sell an electricity surplus to an energy supplier. A direct exchange between consumers is not yet possible. Since 2014 the Dutch government has created legislation which enables consumers to sell their energy back to their energy supplier at the same price they have to pay to the energy supplier (some rules and restrictions apply) (Consuwijzer, 2014). Many local initiatives have since sprouted in a bottom-up fashion, with engaged citizens collaborating to create foundations to generate local energy (Organisatie voor Duurzame Energie, 2014).

1.3 Previous research

As the energy market fulfils today's primary need of energy in the Netherlands, much research has already been done on future planning. Future planning studies on the energy market are initiated for the last ten years almost every year (Vrije Universiteit Amsterdam, 2008), (Energieraad, 2008), (Energieraad, 2009), (TenneT, 2010), (ATOS Consultancy, 2011), (Noorderlicht, 2011), (ECN, 2013), (Hanssen & de Vriend, 2013), (Simons, 2013), (TNO, 2013), (Netbeheer Nederland, 2014). These studies however all focus around a particular subject on the energy market, for example the physical infrastructure or bio- and solar energy. Also, most studies try to calculate the share of renewable energy sources in comparison to conventional energy sources. This study then can take the best practices found in these future studies and apply them to the future of a single type of firm which lie at the heart of energy market: the DSO.

1.4 Focal organisation: Dutch DSO Enexis

The focal organisation in this thesis is Dutch DSO Enexis, listed as Enexis Holding NV at the Dutch chamber of commerce (from here on called: Enexis for the entire holding). The company is a publicly-owned, but commercial company in the sense that the internal organisation corresponds with the organisation of 'normal' joint-stock companies. The company is enlisted as a public limited liability company while all shareholders are governmental organisation (provinces and municipalities). For Enexis, all shares are in hands of the provinces Noord-Brabant, Limburg, Overijssel, Flevoland, Drenthe, Groningen and Friesland, and to some extent in the hands of municipalities in those provinces (Enexis, 2015b); shares can only be traded among these entities, there are no private shareholders. The provinces Noord-Brabant and Limburg together hold more than 50% of total shares. By number of connections, Enexis is the second largest DSO in the Netherlands after Alliander (Enexis, 2012, p. 12).

Enexis' core activity is the building, maintenance, and operation on the Dutch regional electricity and gas distribution networks (Enexis, 2015a), within the boundaries of their established work field. They operate in the same region as the provinces and municipalities who own the shares. In total this amounts to 135.200 km of electricity lines connected to 2.672.000 customers, and 44.800km gas pipes connected to 2.079.000 customers (Enexis, 2015c). This activity is not threatened by competitors as all DSOs operate in their own region holding a monopoly in those regions. Other activities of Enexis are (in part) commercial activities, for which the subsidiary Fudura is used.

Enexis however is able to undertake new ventures on other, but adjacent markets. Their main undertaking is to lead towards a sustainable power supply. This entails not only maintaining the grid, but also expanding on it with loading docks for electric vehicles (Enexis, 2015d), energy innovations for households (Enexis, 2015e) and getting the grid ready for upcoming 'prosumers' (Enexis, 2015f). One example of these endeavours is the Enexis 'Econexis home' (Enexis, 2015g). This 'demo' home is realised on Enexis property in Zwolle and is used to show the pinnacle of today and tomorrow's innovations on the field of energy (efficiency). As told on the website, "everything about the house revolves around the feeling of sustainability" (Enexis, 2015g). The organisational structure of Enexis Holding NV then follows the following structure in figure 1.3-1.

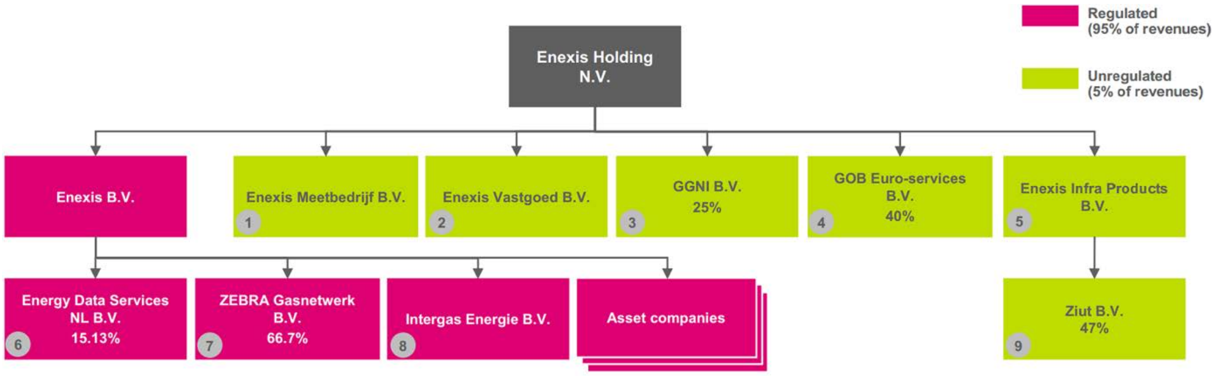

Figure 1.3-1: Enexis organogram
Source: Enexis (2012, p. 10)

The subsidiaries of Enexis are described as follows:

Subsidiaries	Description
1. Enexis meetbedrijf BV	Metering data collection, validation and related services
2. Enexis vastgoed BV	Real estate Ownership
3. GGNI BV	GGNI helps to market Dutch natural gas expertise worldwide
4. GOB Euro-services	Services to small cross border industrial area (Germany & the Netherlands)
5. Enexis infra products BV	Fudura: Non-regulated services and renewable energy network projects
6. Energy Data services NL bv	Provides an array of administrative services on a shared basis with other network companies
7. ZEBRA gasnetwerk BV	The ZEBRA pipe line is a high pressure gas pipe line in the South-West of the Netherlands
8. Intergas Energie BV	Newly acquired gas distributor in the Netherlands (province Noord Brabant)
9. Ziut BV	Ziut provides services in areas of public lighting and traffic control systems

All subsidiaries are used in tandem with Enexis itself to attain its strategic objectives: “to provide Affordable, reliable, sustainable and public-oriented service” (Enexis, 2012, p. 13). Their strategic objectives are summarized in figure 1.3-2.

Figure 1.3-2: Enexis strategic objectives
Source: Enexis (Enexis, 2014b)

As regional DSO Enexis does not need to engage into strategic networks. However, as being active on commercial markets, Enexis does benefit from forming alliances with other companies and engaging in strategic networks. A large strategic network Enexis is active in comes in the form of the industry association ‘Netbeheer Nederland’ (Netbeheer Nederland, 2015); a separate entity created by all DSOs in the Netherlands which acts as a representative of Dutch DSOs.

A second network Enexis maintains is with companies active in sustainable energy solutions (construction companies, installation companies, solar panel suppliers, etc.). Enexis valuates companies and offers their expertise on the self-governed website www.zelfenergieproduceren.nl. Other examples are partaking in “The world’s smartest grid” (Enexis, 2014a) and “Vrije keuze aan de laadpaal” (Enexis, 2015h).

Within Enexis I am part of the project team tasked with executing a future studies to the role the firm should take in the year 2030. My role as graduating intern with Enexis is supporting the team during the entire process, assisting in methodologies, and providing writing guidance.

1.5 Research goals

The current state of the energy market gives lead to this papers research goal. As the future is uncertain, the main goal of this research is an assessment of possible future strategic positions for the Dutch DSO Enexis, and the implications of those positions for the firm. This is done by (1) assessing which trends and driving forces will have an impact on the energy market in 2030; (2) creating four[5] scenario narratives on energy market composition in 2030; and (3) using scenario analysis to analyse the strategic position of Enexis in the energy market and energy network in 2030. The research goal implies two additional objectives. First the identification of important trends and aspects between 2015 and 2030. More specifically, the study will identify, define, and analyse the main driving forces of the Dutch energy market to 2030. A second objective is assessing the importance of trends and trend clusters for the energy market and their implications for society. The final objective of this study is analysing the robustness of the current business model of the DSO Enexis. The relevance of this study lies in the extent of these objectives. The DSO is still a semi-governmental organisation operating on both regulated and unregulated market; but with an uncertain future and a pending transition, the roles and core activities of the DSO are by no means carved in stone.

1.6 Research questions

The research focusses around the following central **descriptive** question:

What are plausible strategic positions for Enexis in the energy market in 2030?

This question builds on five sub-questions to meet all research goals. The first sub question assesses the current strategic position of Enexis in order to create a basis for further analysis:

1. What is the current strategic position of Enexis?

Secondly, an inventory is made of all trends and other driving forces which have an influence on the energy market. This inventory is clustered based on trend theory and strategic categories.

2. Which trends and driving forces can be identified in the near future?

[5] See chapter 2.1

The trend clusters are consequently used to create a framework for scenario analysis, based upon the selection of the two most uncertain and impactful trend clusters (key uncertainties) as scenario axes.

3. What are the two most uncertain and impactful trend clusters for different energy market scenarios?

The key uncertainties are used to for axes for a scenario matrix, in which four scenario narratives on energy market composition in 2030 can be written.

4. Which scenarios can be constructed based on the two key uncertainties?

These scenarios are finally used to assess the future strategic position of Enexis. This final step entails scenario analysis to describe the most important developments and their direction over the next 15 years and their implications for the strategic position of Enexis.

5. What implications do the scenarios show in terms of strategic future for Enexis?

The shape of this research is illustrated in figure 1.5-1.

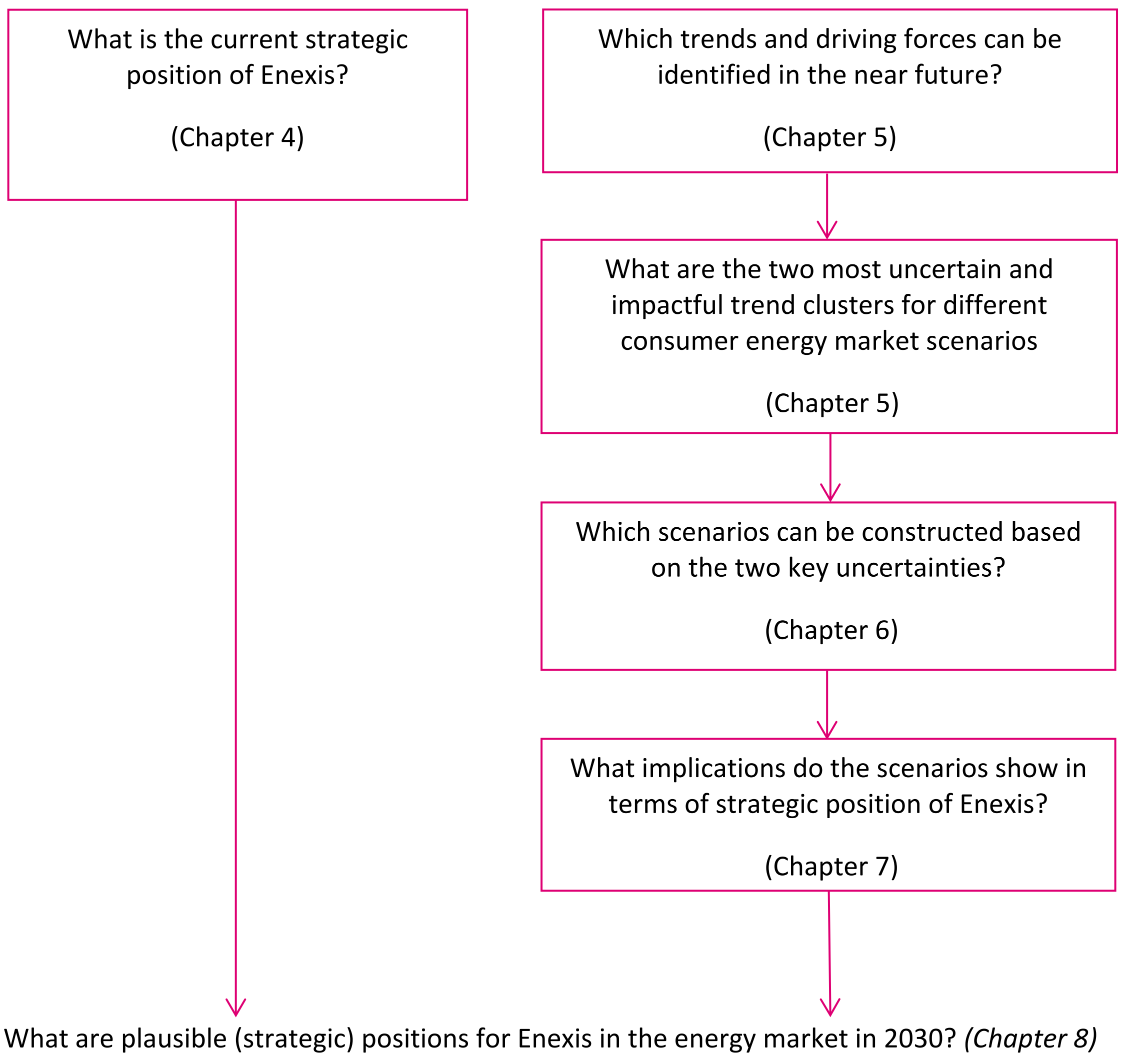

Figure 1.5-1: research structure

1.7 Chapter overview

The paper is structured to house the 8-step model by Peter Schwartz. First, the background containing the focal issue has been elaborated in chapter one (step 1). The theoretical framework used is presented in chapter two. The methodology guiding this research will follow in chapter three. Chapter four will assess the business model analysis which is used to define the scope of the research and provide a basis for the environmental analysis (step 1), after which chapter five will elaborate the environmental analysis (steps 2-5). Chapter 6 will begin with describing the scenario matrix, after which the scenario narratives are constructed (step 6). The scenarios are presented in a closing expert workshop to explore scenario implications (step 7) in chapter 7, followed by the final conclusion by selecting leading trends and driving forces (step 8).


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Theoretical framework

Chapter II – Theoretical framework

The theory used in this paper contains first of all strategic analysis using the conceptual model presented by Kim et al (2008), expanded on using Porter's generic strategies (Porter, 1980) and PEST analysis. Both theories are used in order categorize trends found and to assess the strategic position. Porter's five forces framework is used in tandem with a PESTEL analysis in formulating a guiding structure for the creation of scenario narratives. Second, business model theory is used to assess the core activities and the value proposition of the focal organisation Enexis, both current and later on in each scenario. The industry change model is used to assess the current energy transition and to highlight the need for scenario analysis. Network theory is used in order to grasp the concepts of strategic networks and alliances in order to distinguish possible future partners. Finally, trend analysis theory is used together with PESTEL categories to better grasp underlying principles.

2.1 Strategy analysis

The strategic position of Enexis is studied using the conceptual model presented by Kim et al. (2008), which builds on two distinct views: the competitive strategy view and the resource-based view. The conceptual model links both views as complementary to each other in creating a firm's strategic position, which lead to firm performance as depicted in figure 2.1-1.

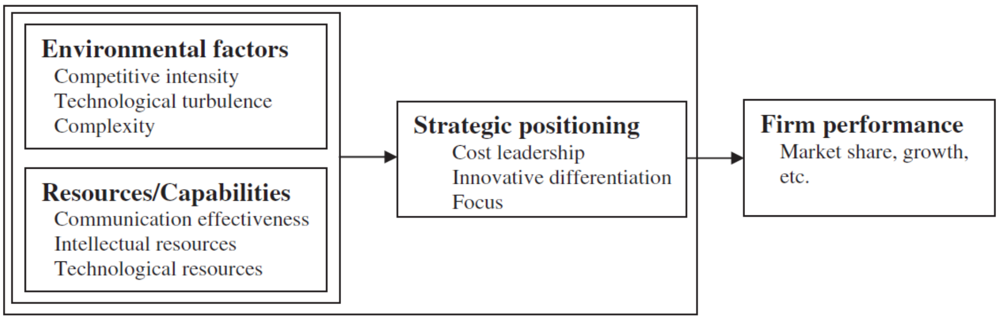

Figure 2.1-1: conceptual model
Source: Kim et al. (2008)

2.1.1 Environmental factors

In the more immediate environment, environmental factors fall into three distinct categories: competitive intensity, technological turbulence, and complexity. Competitive intensity refers to "the extent to which an organization affects its rivals' chances of continued survival in the marketplace" (Kim, et al., 2008, p. 205). Technological turbulence second refers to the volatility of products, services, demand, and sales, resulting from technological, economic, and cultural change (Kim, et al., 2008, p. 205). Complexity lastly refers to the "heterogeneity and range of activities of an organisation" (Kim, et al., 2008, p. 205).

Competitive intensity can be analysed using the five forces framework by Porter (1979). Porter distinguishes between five distinct forces which affect the competitiveness of a firm, as depicted in figure 2.1-2.

Threat of current competitors is evident in all industries; rivalry between existing competitors forms the market and leads to strategic positioning. It is argued that the higher the competitive intensity in a market, the less profit the company is expected to generate (Kim, et al., 2008, p. 205). In most markets there also is a threat of new entrants entering the market and becoming competitors. The same argument can be made for the threat of new or substitute products for your own products.

Finally Porter recognizes the bargaining power of buyers and suppliers (firms which offer any of four basic production factors land, labour, capital, and human capital (Samuelson & Nordhaus, 2004)[6]) as forces of competitiveness; a firm who can handle the bargaining with buyers and suppliers will likely have a better strategic position than firms who are less equipped to bargain.

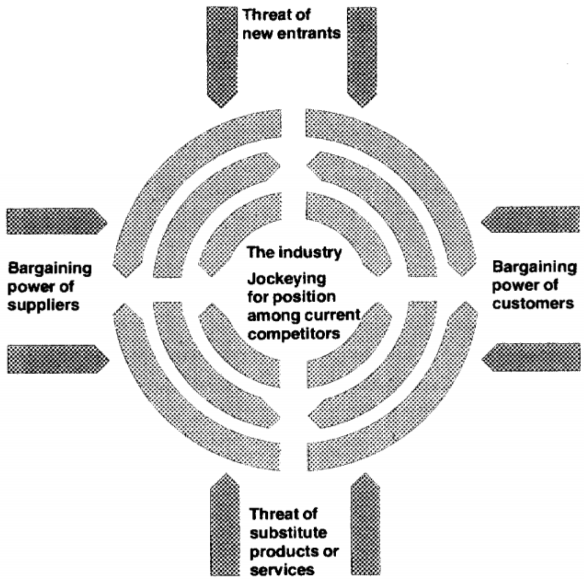

Figure 2.1-2: Five forces framework
Source: Porter (1979)

In the more distant environment, factors can be distinguished using the PEST framework; analysis the Political, Economic, Social, and Technological factors (Collins, 2010). These categories can be used to provide a structure for scenario analysis and the factors which are needed to be accounted for. For political, issues like political stability, pricing regulations, work week, and tax rates are important. For Economic, issues like government intervention in the free market, infrastructure quality, inflation rates, and specific industry factors. For Social, issues like demographics, attitudes, and lifestyle trends. For technological, issues like the rate of technological diffusion, possible replacement technologies, and information / communications (Collins, 2010).

2.1.2 Resources & capabilities

A firm's resources and capabilities are divided into three categories according to Kim et al. (2008): communication effectiveness, intellectual resources, and technological resources. Communication effectiveness refers to "the extent to which delivered messages influence the knowledge structure of the receivers" (Kim, et al., 2008, p. 206). Intellectual resources are mostly intangible resources protected by law (intellectual property, patents, copyrights, commercial secrets), but also resources like reputation and databases. Technological resources on the other hand are not only tangible resources like tools, products and systems, but also intangible resources used to create goods or services (Khalil, 2000). According to the Resource Based View (RBV), a resource holds the potential for a sustained competitive advantage when it is Valuable, Rare, Inimitable, Non substitutable, and Organisable (VRIN/O) (Barney J. , 1991). Multiple critiques can be identified against this classification, of which most are caught by the review of Kraaijenbrink, Spender, and Groen (Kraaijenbrink, Spender, & Groen, 2010). The RBV typology of resources is however still helpful in that a firm resource ought to contribute to the prosperity and success of the company.

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[6] Some scholars argue that energy, human capital and entrepreneurship may be added to the picture but they can also be incorporated into the classical factors

It is believed that effective communication between departments and personnel can improve the transfers of skills and increase meaningful social interactions, leading to an open and positive organisational culture (Hall, 1993). Intellectual resources are argued to enhance the performance of firms (Hall, 1992) (Teece, et al., 1997) (Teece, 1998).

2.1.3 Strategic positioning

Porter (1980) distinguishes three generic strategies to generate a competitive advantage: cost leadership strategy, innovative diffusion strategy, and focus strategy. If a firm wants to be the 'best' in the market, Porter argues that the firm should focus completely on one strategy, disregarding the other two. When a firm follows two or even three strategies (for example for different products) the firm is 'stuck in the middle' according to Porter (1980); i.e. not optimal. Treacy and Wiersema argue however that a firm is able to follow different strategies for different products (product groups) or business units (Treacy & Wiersema, 1997). Their suggested model for strategic positioning incorporates three value strategies: operational excellence, customer intimacy, and product leadership. A firm can best compete in the market when it puts effort in all three strategies, but focussing on one strategy to make the difference.

A product leadership value strategy first entails excelling in product innovation and brand marketing. The firm's focus is on the continuous development of state-of-the-art products and services by stimulating innovation and shortening time-to-market.

An operational excellence value strategy second focusses on business processes, operations, and execution. Efficiency and supply chain management are key focus point for top management. The focus is delivering the perfect combination of price, quality, and purchasing ease. Firms following this value strategy usually are task oriented, have limited variety in their product offerings, and offer no to little extras.

A customer intimacy value strategy finally focusses on excelling in customer attention and customer service. Customer relations management (CRM) is a core activity of a firm following a customer intimacy value strategy. The value propositions of these firms often entail the delivery of products and services on time and above expectations and reliability. These firms operate close to the customer and often have a large product range.

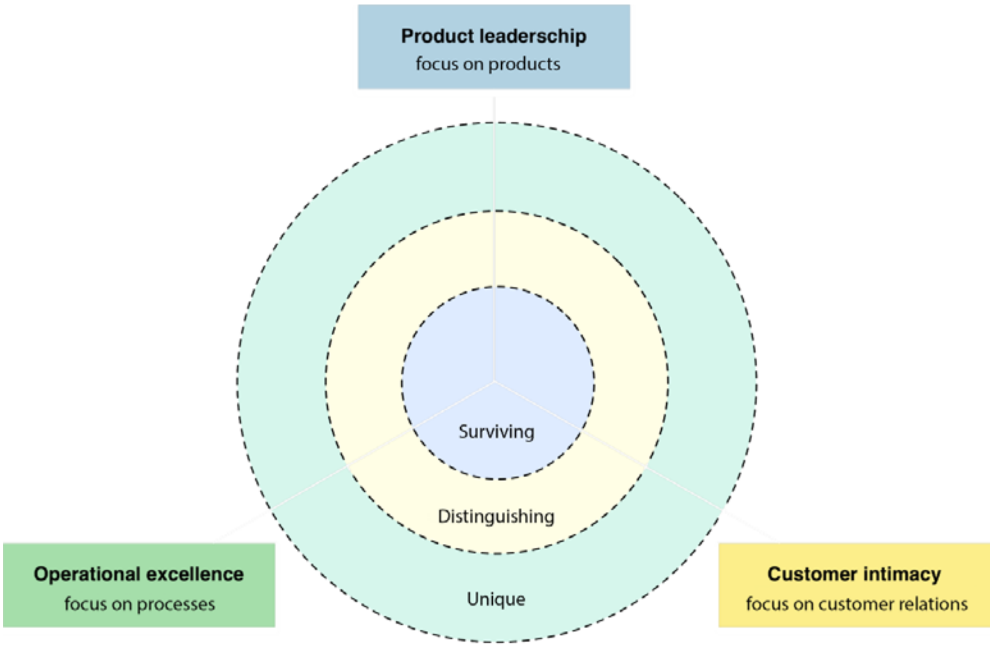

Figure 2.1-3: Value strategies by Treacy & Wiersema (1997).
Source: strategischmarketingplan.com (2015)

As figure 2.1-3 illustrates, a firm needs to put effort in all value strategies in order to 'survive'. By increasingly putting effort into one strategy, a firm can rise to a distinguishing or even unique value proposition for its customers, creating a competitive advantage.

2.2 Business model composition

When applying a strategy to your business processes, an interceding framework can be used to describe the 'logic of a firm': the business model (Al-Debei & Avison, 2010). The business model then "describes the rationale of how an organization creates, delivers, and captures value" (Ostenwalder & Pigneur, 2010). It describes the value proposition for customers, details on how the offering is produced and delivered, and an estimation of projected costs and benefits (Chesbrough & Rosenbloom, 2002). Understanding a firm's business can also assist in mapping the organisation to its external environment and interactions with its environment (Al-Debei & Avison, 2010, p. 369) in order to create and maintain an strategic position.

The business model of Enexis is illustrated using the Business Model Canvas by Ostenwalder (2010). The canvas acts as a presentation tool which purpose is to enable companies to directly view their business model and identify strong and weak points in it. The canvas is illustrated in figure 2.2-2.

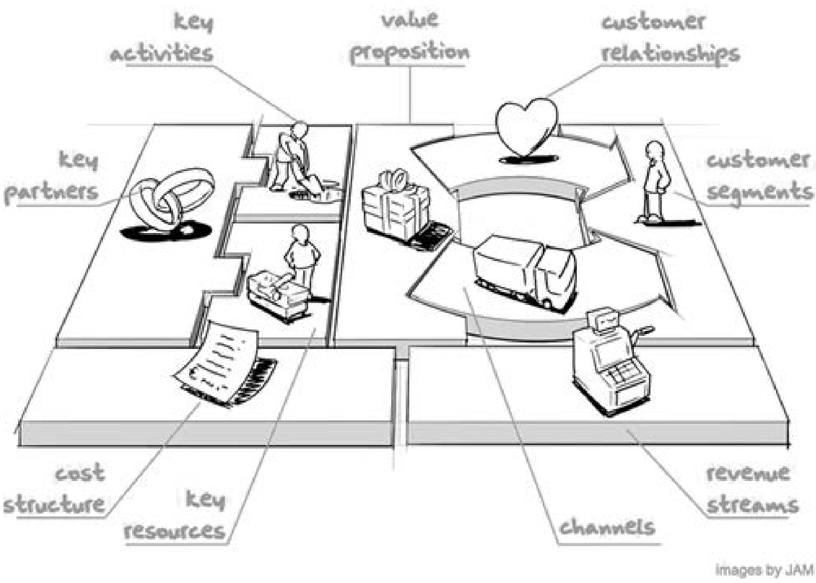

Figure 2.2-1: Business model canvas
Source: Ostenwalder (2010)

The canvas entails nine components:

- Key activities
- Key partners
- Key resources
- Cost structure
- Value proposition
- Customer relationships
- Customer segments
- Distribution channels
- Revenue streams

The key activities refer to the most important activities which create the value proposition of the firm. The firm should clarify how it adds value to the quality of the product, how the firm shapes their customer relations and how to attract new customers. The key partners of the firm refer to the partnerships which are important to the success of the firm and which enable growth potential / increase the competitive position: 'the whole is more than the sum of its parts'. The key resources then entail the most important firm resources (both tangible and non-tangible) used to create the value proposition. The cost structure of the business model canvas describes what the most important costs of the firm are, enabling the firm to identify economies of scale opportunities and what resources are expensive. The value proposition defines the added value for the customer when using the firm's product / service. This section of the canvas should describe what the added value is and how the firm differentiates from its competitors. Customer relationships are described in the canvas in order to enable the firm to differentiate into customer segments and build quality relationships with (hopefully) returning customers. The customer segments then enable the firm to research customer (segment) needs and create value to fulfil those needs, for example by offering differentiated products. The distribution channels then describe the marketing and distributing strategy of the firm in delivering their products. The revenue streams finally clarify where both present and future returns stem from.

2.3 Industry change

A firm however always operates in a given market (or given markets), and environmental factors can influence not just one firm but an entire market. Internally the business models of firms operating in a set market show roughly the same assets, used for roughly the same activities. McGahan (2004) studied the reasons as to why industries or markets change, and found that industries and markets evolve along four distinct trajectories: radical, progressive, creative, and intermediating. These four trajectories are categorized along two dimensions. The first dimension concerns the threat to core activities, while the second dimension concerns threats to core assets of firms. The 2x2 matrix is depicted in figure 2.3-1.

		Core activities	
		Threatened	Not threatened
Core assets	Threatened	Radical change *Everything is up in the air*	Creative change *The industry is constantly redeveloping assets and resources*
	Not threatened	Intermediating change Relationships are fragile	Progressive change *Companies implement incremental testing and adapt to feedback*

Figure 2.3-1: Trajectories of industry change
Source: (McGahan, 2004, p. 90)

Radical change occurs when both core activities and core assets are threatened with obsolescence. The industry's capability and resources seem to be diminishing due to an external alternative. An industry on a radical trajectory then is completely transformed over the course of decades, resulting in a completely reconfigured industry (McGahan, 2004, p. 89). A positive effect is that industries undergoing radical change "often remain profitable for a long time, especially if the companies in these industries scale back their commitments accordingly [...] Businesses also have time to develop strategic options that can be exercised in the future if they recognize the trajectory they are on early enough" (McGahan, 2004, p. 89).

Intermediating change then occurs when an industry's core activities are threatened, but the core assets like brand capital, patents and knowledge are not threatened (McGahan, 2004, p. 89). This most often occurs when buyers or suppliers have gained access to new information. Managing a firm in an industry undergoing intermediate change then often proves extraordinarily difficult, as firms need to "simultaneously preserve their valuable assets and restructure their key relationships" (McGahan, 2004, p. 90). These firms often resort to unconventional ways of generating value from their core resources by entering new businesses or even new industries.

An industry undergoing creative change suffers from threatened core assets, whilst core activities remain unthreatened. Relationships with customers and suppliers are stable, although the resources of firms are under constant change. McGahan shows the example of the film industry, in which relations with actors, agents and theatre owners are ongoing, but having unstable assets: new films (McGahan, 2004, p. 91). The distinction with a radical trajectory is not always clear however, making firms “overreact and neglect important relationships that are critical to their profitability” (McGahan, 2004, p. 91).

Progressive change trajectories finally can be characterised by creative evolution. Neither core assets nor core activities of firms in this industry are threatened. In industries on a progressive trajectory innovation happens, but “within the existing framework of the business” (McGahan, 2004, p. 91). Innovations then are mostly incremental changes, which can lead to major improvements and changes industry-wide.

2.4 Network theory / strategic networks

As firms operate within a market, entering strategic networks with key partners in their environment enable the creation of “inter-organisational ties that are enduring and of strategic significance for the firm entering them” (Gulati, et al., 2000, p. 203). According to Sydow and Windeler (2003), “an inter-firm network is conceived as an institutional arrangement of some duration among distinct but related for-profit organizations, based on reflexively agreed inter-firm division of labour and inter-firm cooperation” (p. 72). Networks then can be studied at three distinct levels (Zaheer, et al., 2010): Dyadic level, Ego level and Network level. These levels are categorized by four theoretical mechanisms: resource access, trust, power / control, and signalling (Zaheer, et al., 2010, p. 64).

Gulati et al (2000) also argue that the presence of strategic networks can have a significant impact on the profitability of firms in an industry. A strategic network then is comprised of nodes with connections between them; if a node is not connected it is not part of the network. These networks can be based upon two types of arrangements: contractual arrangements or equity arrangements as depicted in figure 2.4-3.

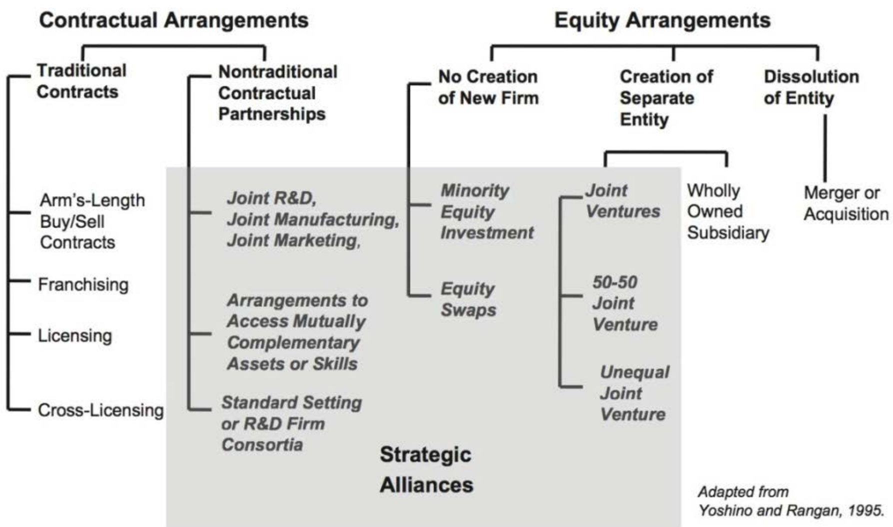

Figure 2.4-1: Scope of interfirm relationships
Source: Kale & Singh (2009)

Based on these two types of arrangement a spectrum of different networks can be created. The greyed out part of the figure is the most interesting when looking at strategic networks, as these are voluntary partnerships between two or more firms, with relations based on trust. These strategic alliances are opportunities for the focal firm to gain "information, resources, markets, and technologies; with advantages from learning, scale, and scope economies; and allow the firm to achieve strategic objectives, such as sharing risks and outsourcing value-chain stages and organizational functions" (Gulati, et al., 2000, p. 203).

2.5 Trend analysis

A trend can be defined as "A general direction in which something is developing or changing" (Oxford Dictionary, 2014). These occur with a high amount of certainty. Trends can be categorized in short-, intermediate-, and long term trends(Investopedia, 2014). Long term trends, also called secular trends, are trends lasting one to three decades. These are encompassing many primary trends, which normally last between one and three years. Going down to intermediate term trends, intermediate trends typically last between 1 – 6 months, and are comprised of at least three intermediate cycles lasting between 2 – 8 weeks (Investopedia, 2014). Apart from trends we can identify driving forces. A driving force is more dubious in nature, has a wide variety in directions whilst having a large societal impact (Hanssen & de Vriend, 2013). Driving forces can be used to create more diverse scenarios.

In the case of a market in transition, intermediate trends will likely have a much smaller effect on the market than primary and secular trends. As McGahan argues; "To truly understand where your industry is headed, you have to shut out the noise from the popular business press and the pressure of immediate competitive threats to take a longer-term look at the context in which you do business" (McGahan, 2004). The time frame of this forecasting thesis is 10 years from now; making both primary and secular trends important indicators for the future.

Most studies done on the field of the future energy market identify categories of trends, or clustered trends. Most authors agree on using the PESTEL framework for trend categories: political, economic, social trends, technological, environmental, and legal (Mantzos & Capros, 2006) (TenneT, 2010) (Capros, et al., 2010) (PricewaterhouseCoopers, 2012) (European Commission, 2004). This categorization is helpful to better grasp relations between trends and correlations between trends and driving forces. The categorization also assists the cross impact analysis later on to form trend clusters to analyse and provide a backbone structure for mocking up scenario narratives.


ENEXIS

Methodology

Chapter III – Methodology

Following the main research question, this study will identify and assess trends and driving forces in order to formulate possible scenarios for the future energy market. “The future is already here – it’s just not very evenly distributed” (Gibson, 1990). The creation of scenarios is hence based upon past and present trends, as they are indicators for the future. An explorative approach is used according to the typology proposed by Börjeson et al. (2006), structured by Schwartz’ 8-step approach (Schwartz, 1996).

3.1 Scenario analysis

Scenario analysis has traditionally been used for constructing and hypothesizing different possible futures, not to predict the correct or real future (Roubelat, 2000). Scenario building then is rather a foresight than a forecasting tool. The goal of scenario planning often is to initiate a debate concerning long-term planning and strategies.

The field of scenario planning encompasses many different techniques and steps to take. Literature reviews by Notten et al. (2003), Bradfield et al. (2005), Börjeson et al. (2006), and Amer et al. (2013) provide an overview of the multitude of approaches to scenario planning proposed over the years. Distinctions between approaches can be best made visible using the typology proposed by Börjeson et al. (2006): predictive, explorative, and normative scenarios. Predictive scenarios first offer a forecast of the future, answering the question of what *will most likely* happen in the future. Explorative scenarios second assess the question what *can* happen in the future, providing a strategic insight from past and present trends towards the future. Normative scenarios finally follow a distinct path best described by causation; answering the question of *how a specific future end state can* happen. Many scenario building approaches have been formed over the years **(** (Heinecke & Schwager, 1995)**;** (Godet & Roubelat, 1996); (Schwartz, 1996); (Reibnitz, 1999) **)**, of which the 8-step approach by Peter Schwartz is used as this approach is developed for management purposes:

1. Identify focal issue & trends
2. Identify key driving forces in macro and micro environment
3. Listing of driving forces & trends
4. Ranking of driving forces & trends
5. Selection of two most uncertain key driving forces as scenario axes
6. Fleshing out the scenarios based on identified trends in step 1 to 3
7. Exploration of implications
8. Selection of leading indicators

Wilson (1998) argues a futures study should select between two to four scenarios, based upon five criteria:

- Plausibility of the scenarios
- Differentiation of the scenarios
- Consistency between scenarios
- Decision-making utility of the scenarios
- Challenge of conventional wisdom in the scenarios

As the method proposed by Schwartz uses two scenario axes, the logical consequence is the creation of four scenarios. Future studies often combine multiple techniques in order to create a more reliable result. Wang & Lan for example used a combination of scenario analysis and the technological substitution model (Wang & Lan, 2007), while Bañuls and Turoff used cross-impact analysis and the Delphi method in order to cluster scenarios (Bañuls & Turoff, 2011). This research will use multiple data sources order to triangulate data gathered and gain a high level of reliability.

3.2 Research design

The 8-step approach of Peter Schwartz is used to structure this research. The steps proposed by Schwartz are translated using related techniques (Ratcliffe, 2000) into research steps which form the methodology of this paper:

Schwartz's 8-step approach to scenario building	Methodology used in this research
1. Identify focal issue & scope	Desk research to focus the scope, identify stakeholders and experts
2. Identify key driving forces in macro and micro environment	Environmental scanning: Desk research, qualitative expert interviews with found experts *(n = 20)*, and expert workshops (Delphi) with project team (*n = 15)* and board of directors *(n = 9)*
3. Listing of driving forces & trends	List indicators and trends found; clustering of trends in project team workshop *(n = 7)* structured by trend analysis theory
4. Ranking of driving forces & trends	a. Cross-impact analysis (Delphi) with project team workshop *(n = 7)* b. expert survey (n = 24) based on trend clusters
5. Selection of two most uncertain key driving forces as scenario axes	Expert workshop with project team *(n=7)*; expert workshop with project team *(n = 11)*
6. Fleshing out the scenarios	Creative thinking techniques structured by strategic analysis theory
7. Exploration of implications	Expert workshop with project team *(n = 15)*
8. Selection of leading indicators	Desk research

The research design enables triangulation by using multiple data sources and collection methods which emphasize the methodological thoroughness and credibility of this research. According to Bijl (1992), environments with a constant and linear future need only quantitative data collection in order to be significant. In more complex and uncertain environments as the energy market however, a combination of both quantitative as qualitative data collection methods is required to create robust and meaningful scenarios.

The first step of this research aims at identifying the focal issue and field experts, which is translated as the creation of an overview of the energy market network. This desk research is comprised of both primary and secondary data sources (studies, scientific papers, books, company reports, research programs, expert communities) and by using the network of project team members of Enexis[7]. In the second step field experts are asked to assist in identifying major and minor trends and driving forces which will likely have an impact on the energy market in the coming fifteen years. Desk research is supplemented by (1) two brainstorming sessions with the board of directors and the project team, and (2) expert interviews to generate even more trends. This identification of trends and aspects is accompanied by desk research in both primary and secondary data sources. When all trends are inventoried, trends are clustered using a third expert workshop based on both theoretical categories and association. The result of this step is a list of trend clusters which are used as input in the following step, the cross-impact analysis and expert survey.

[7] Based upon knowledge concerning experts at other firms and acquaintances

The cross-impact analysis will first be used to identify dependencies between trend clusters to get a sense of importance and direction between clusters; which trend cluster 'drives' other trends? The survey second is used to assess the impact (on Enexis) and uncertainty (of direction of the trend) of individual trend clusters. The result of this step is using the weight (cross-impact) of trend clusters, their importance and their uncertainty for the selection of the two most uncertain key driving forces (trend clusters) as the axes for the two-dimensional scenario map (step 5).

Using these two axes, a total of four scenarios are fleshed out in step six based upon axial characteristics. Scenario narratives are guided by scenario issues identified in an uncertainty matrix. Creative thinking techniques are used to fill in the details of the scenarios and assist in discussing key trends and characteristics.

A peer review expert workshop is finally used in step 7 to explore the possible implications of the fleshed out scenarios, serving as a member check to evaluate the scenarios and provide suggestions for improvements.

The expert interviews, expert workshops and scenario planning method have been integrated in order to combine data sources to increase robustness and the objectivity of the results, as the methods could not provide the same findings when used alone (Nowack, et al., 2011).

The structure of this research design is graphically shown in figure 3.2-1.

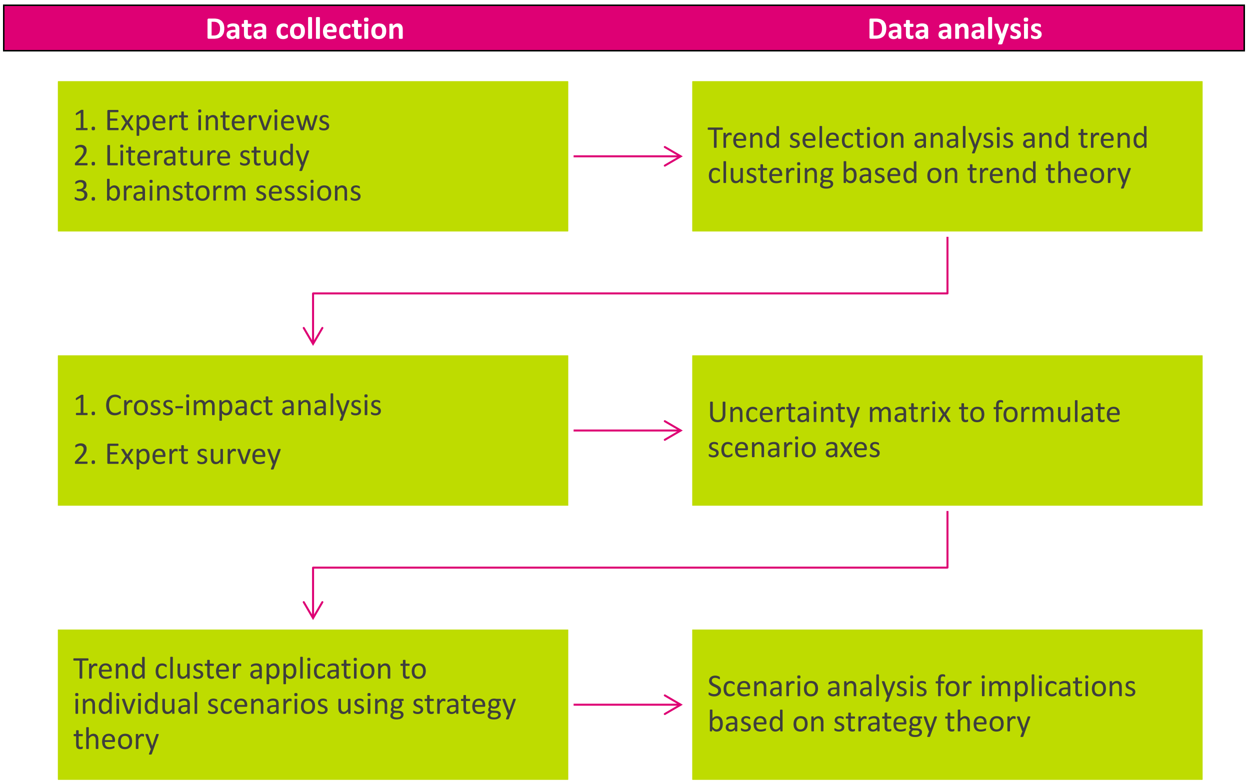

Figure 3.2-1: Scenario analysis research design

3.3 Data collection

Four distinct data sources are used in this research: (1) desk / literature research; (2) expert interviews; (3) multiple expert workshops, and (4) expert survey.

3.3.1 Step 1: Literature review

Step 1 is to collect trends and driving forces using multiple trend rapports by leading (international) firms. A total of 34 trend documents are selected, which are listed in appendix E. Each document is scanned by two members of the project team in order to identify all important trends. Each project team member is instructed to identify the five 'most important' trends, with a high perceived impact. Doubles are removed from the list after both members have scanned a document.

3.3.2 Step 2: Expert interviews and expert workshops

The experts for the interviews are chosen based upon their expertise and involvement with the energy market. These experts operate on both the energy market and adjacent markets like advisory / educational institutes, energy suppliers, and construction companies. The selection goal is to create a heterogeneous sample with multiple areas of expertise on the energy market. This round is comprised of qualitative, semi-standardized interviews. A sample of 20 interviews is chosen as this will enable a "comprehensive analysis without being overwhelming (Onwuegbuzie & Leech, 2007). Selected experts are contacted via telephone first, email if no telephone number is provided. Selected respondents are included in appendix F, the interview sheet is included in appendix G. Reliability of this sample is perceived high, as all respondents are experts in their own field, have experience on or with the energy market, and form a large enough sample for a qualitative analysis.

Also in step two, expert workshops are used to identify more trends and driving forces. The first workshop is held with the board of directors of Enexis BV, as they all are experts in their fields and possess a great deal of practical information. A second workshop with the project team is held to identify trends based upon every member's distinct background, as each member is manager on a different field (customer relations, smart grid operations, etc.). During these sessions all members can input their thoughts (based on their own experience, literature reviews conducted and interview results) on trends and driving forces.

3.3.3 Step 3: Delphi workshop for trend cluster forming

In the third step the list of trends found are clustered in a project team workshop in order to be able to grasp the essential trends which are workable (900+ individual trends are not workable). Clustering is done based upon expert discussion during the workshop. The result of this step is a list of trend clusters which are used as input in both the cross-impact analysis and the expert survey.

3.3.4 Step 4: Cross-impact analysis & expert survey

The found trend clusters are used in a cross-impact analysis in order to assess the dependencies of the different clusters on each other. Often the cross-impact matrix (CIM) is used in order to test the probabilities of an event happening when another event happens (Gordon, 1969). In this research the CIM is used to assess the impact and causation between trend clusters (Jeong & Kim, 1997). This is done using a cross-impact matrix (CIM) on which clusters are ranked against each other on a scale from 0 (no causation / impact on the other) to 3 (high causation / impact on the other). This method provides a mathematical basis on which to identify the clusters which are most independent from other clusters and to find the clusters on which most other clusters depend. The trend clusters are also used as input in the expert survey, which is send out to both the board of directors and the entire project team in order to assess both the impact and uncertainty of the clusters. A bias exists due to the selection of only internal experts for the survey, however due to time constraints and the extensive knowledge of experts this bias is acceptable as the entire project is used for internal use. Both are assessed on a Likert scale from very low (0) to very high (5). For the survey the tool 'Surveymonkey'[8] is used.

3.3.5 Step 6: Fleshing out scenarios

When the scenario indicators are chosen and the matrix has been defined, an expert workshop with the project team is used in order to mock up concrete focus points within each scenario. These focus points are used to create vivid narratives to really grasp the future within each scenario. The additions by the project team are added to the first draft versions of scenarios which are used as guidelines.

3.3.6 Step 7: Peer-review workshop

The peer review expert workshop finally will consist of the entire project team and will focus on discussing the constructed scenarios and their implications.

3.4 Data analysis

Data is analysed in multiple steps of the research in order to proceed. The first analysis step is analysing found literature on trends and driving forces; combined with an analysis of the interview transcripts to create a 'grand list' of trends and driving forces, which is consecutively reshaped to formulate trend clusters. These clusters are then used as input to both the cross-impact analysis and the expert survey. Next the results of both the cross-impact analysis and the survey are combined to produce a ranking of found trend clusters to determine key uncertainties to use as scenario axes. The final analysis step is analysing the scenario implications after the scenarios have been produced.

3.4.1 Step 2: Trend analysis, expert workshop, and expert interviews

Trends are selected based upon their perceived impact on the focal question. Both primary trends and secular trends are identified and classified for the energy market. This analysis encompass processing information gained from both desk research and expert interviews using open coding techniques to disaggregate the data into small units with labels for each trend (Saunders, et al., 2009). All trends are recoded into trend clusters to make them useable for further analysis.

3.4.3 Step 3: Expert workshop for trend analysis and cluster forming

When all trends are identified, a brainstorming session with the project team will enable a thorough discussion into the impact and importance of all trends for Enexis. This brainstorming session will assess trend clusters. This recoding into clusters is based upon consistency within trends, trend categories, focus points and similarities in an expert workshop with the project team.

3.4.4 Step 4: Cross impact analysis and expert survey

The cross-impact analysis is executed by creating a matrix with trend clusters on both axes and offsetting them to each other (Porter & Xu, 1990). The impact of the horizontal trend on the vertical trend is ranked on a scale from 0 (no impact) to three (high impact). This is done for all possible combinations; the aggregate mean of the entire horizontal row then gives the average impact of the trend on all other trends. In other words, it shows the dependence of other trends on the focal trend.

[8] www.surveymonkey.com

The expert survey will produce scores for individual impact and uncertainty of each trend cluster. The three values combined (cross-impact, uncertainty, individual impact) are then weighted against the overall average to see whether the stand out.

3.4.5 Step 5: Selection of scenario axes

The clusters are assessed based upon the highest relative scores of each cluster in both the cross-impact analysis and the expert survey, taking into account the workability of the clusters in terms of scenario axes. To provide additional structure for this selection, an uncertainty / importance matrix is formulated using the structure shown in figure 3.4-1. The structure is formed using uncertainty and impact as axes (output from expert survey), resulting in four quadrants: waste, 'there is no alternative', secondary issues, and scenario issues. Waste first of all encompasses issues which have both a low degree of uncertainty and a low degree of importance for the research question. 'There is no alternative' second encompasses important trends, but as these trends are not uncertain, they are trends which offer critical planning issues, but they make poor choices for scenario axes. Secondary issues then have high uncertainty, but are of relative low importance to the main research question, making them less applicable as scenario axes (Conway, 2003). Scenario issues finally are the trends which are potential candidates for scenario axes: they have both high uncertainty and have a high importance for the main research question.

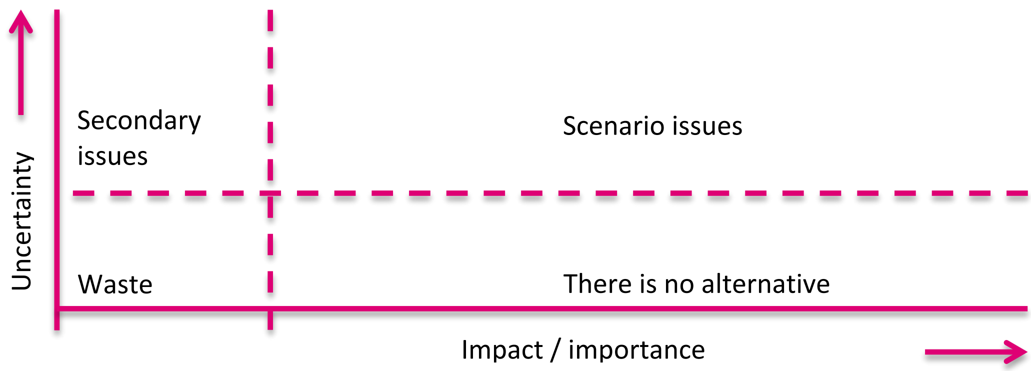

Figure 3.4-1: Uncertainty / importance matrix
Source: University of Twente (2011, p. 15)

The scenario issues are then revaluated using the cross-impact score, and filtered on their relation to the focal question in order to formulate the two scenario axes. Ideally, one axis is a more abstract, or macro-economic trend, providing enough vagueness to really provide flesh to the scenarios; whilst the second axis is a more detailed trend happening in the direct environment of Enexis. The interplay between an abstract and a concrete trend offers the best possibility to create lively scenario's with a good amount of detail, while allowing for differentiated views on the future (de Vries, 2015).

3.4.6 Step 7: Expert workshop on scenario implications

The final analysis is the result of the peer-reviewed expert workshop in which the scenarios and their implications are discussed with the entire project team and the board of directors.

4

Business model analysis

Chapter IV – Strategy and Business model analysis

This section assesses the current situation of Enexis in terms of their strategy and business model. This chapter is structured to provide a logical narrative beginning with the current business strategy, leading to the business model and the energy network. The result of this first step is to provide an analysis of the strategic position of Enexis, their corresponding business and a basis for the scenario analysis.

4.1 Current business strategy

The DSO occupies a unique position in the Dutch energy sector. Its primary function is to maintain the electricity grid and gas network and provide their services to all consumers in the Netherlands. The DSO operates all medium and low voltage grids (regional and local), whilst Tennet and Gasunie operate the high voltage grid and main gas network (national). The DSO is semi-government owned by law (the DSO is required by law to give governmental organisations a majority share) (BRON). Their strategic position then is somewhat different then companies operating in the private sector. The main difference lies in the competitive intensity on the core market: there is none. The DSOs all have a distinct region where they perform their core activity (building & maintaining the grid). Enexis' strategy is laid out in strategy plans for a period of 5 years. The current strategy focusses on four policy 'pillars': reliable, affordable, sustainable, and customer centred (Enexis, 2014b) as depicted in figure 4.1-1. Within these four pillars Enexis has nine goals.

Figure 4.1-1: Enexis 4 strategic pillars
Source: Enexis (2014)

Reliable

1. The reliability and security stay at the current high level;
2. Enexis has insights in the energy transition and will adapt its existing grids to meet future needs;

Affordable

3. Enexis is the DSO with the lowest tariffs;
4. Enexis' shareholders receive fair returns from regulated activities;

Customer oriented

5. Customer relations are valued by the customer with at least a 7.5;
6. Enexis is transparent and offers their data to full potential;

Sustainable

7. Enexis brings partners, governments and knowledge together in realising the goals set out in the Energy policy (Het Energie akkoord);
8. Enexis stimulates customers actively concerning energy efficiency investments to outweigh the costs of smart metering;
9. Enexis works energy-neutral. Enexis makes sure that 14% of net losses are additionally sustainably produced within the Netherlands.

This strategy is laid out against the conceptual model by Kim et al. (2008) to see where issues might arise. Components of the conceptual model are discussed separately.

4.1.1 Environmental factors

Kim et al. describe environmental factors influencing a firm's strategic position as (1) competitive intensity, (2) industry turbulence, and (3) environment complexity. These concepts depict the degree of competition in the market, the volatility of the market, and the complexity of the firm's environment.

Whilst there is no competitive intensity on the core activity, the company has entered the commercial market on related fields (i.e.: energy efficiency, R&D, rental / installation of energy stations for large businesses). On these markets Enexis competes with other (similar) firms like Alliander for customers in order to create a competitive advantage (SCA). When applying the five forces framework by Porter (1979), Enexis' strategic position is threatened by both new entrants (new energy service companies) and substitute products / services on core activities (customers going off-grid, producing their own energy), but also more and more by the increasing bargaining power of buyers (increasing customer demand for information, additional control).

These threats are mostly due to technological turbulence on both the energy market and adjacent markets (Dana, 2015). Technological innovations rapidly follow up on each other making it hard for large firms to 'keep up'. Enexis tries to fulfil a leading role in their markets whilst remaining affordable, but is continuously threatened by the uncertainty accompanying technological turbulence (Kim, et al., 2008, p. 205).

Enexis then has a rather complex environment due to the heterogeneous range of activities the firm partakes in. Whilst all activities are focused close to the core activities, they operate in other niche markets in which more and more other players are active. This environmental complexity gives rise to uncertainty and will likely “decrease the changes of using capabilities and resources to develop strategy” (Kim, et al., 2008, p. 205), as will be shown later on in the scenario analysis.

4.1.2 Resources & Capabilities

Kim et al. (2008) distinguish communication effectiveness, intellectual resources, and technical resources. For a resource to provide a strategic benefit to a firm, the resource ought to be VRIN/O according to the RBV. Enexis has a large degree of customer interaction (connections, maintenance, etc.) and is visible in society (especially when things go wrong, like power substation downtime). Quality communications between all departments within Enexis BV and its subsidiaries therefore can enhance the quality of their services and generate competitive advantage on commercial activities.

As energy distribution system operator Enexis has abundant intellectual resources concerning the energy market infrastructure. These resources are VRIN/O and provide the firm with a competitive advantage on commercial activities. The firm pioneers on energy efficiency and energy improvements, generating intellectual property and reputation.

Technical resources are abundant in Enexis Holding NV and its subsidiaries. Information technology innovations lie at the heart of many activities of Enexis and enables Enexis to better interact with their customers and improve on existing systems which facilitate and monitor energy transfers. Enexis however should be wary that “continuous technological innovations are required to provide new products and services” (Kim, et al., 2008, p. 206) to maintain a competitive advantage. Other technical resources encompass the entire physical energy grid, which is a key VRIN/O resource for the DSO.

4.1.3 Strategic position

Following the environmental factors and resources / capabilities of Enexis, the strategic position needs to be discussed per business unit. Enexis as a company however has laid out the strategic goals of affordability, reliability, sustainability, and customer focus. Overall, the company puts a large effort in operational excellence and product leadership strategies; customer intimacy is recognized to be not sufficient by project team members. For the maintenance unit, no strategic position is necessary due to the monopolistic position; in this unit Enexis currently focusses on operational excellence. The subsidiary Fudura, which operates on commercial markets, focusses on product leadership and a high innovation curve in order to gain a competitive advantage.

4.2 Current business model

Linking the business strategy to the business processes, the business model of Enexis resolves around their core activity and accompanying value proposition: the maintenance of the energy grids. Since the liberalisation of the energy market (Amendment to the 1998 Electricity and Gas Act, 2006) the company however has been able to expand on their core activities and offer new value propositions by undertaking new research and development (R&D) and supplemental activities. Examples of these activities are experimenting with establishing loading docks for electric vehicles (Enexis, 2015d), smart (future proof) grids (Enexis, 2015f), and energy-neutral housing (Enexis, 2015g).

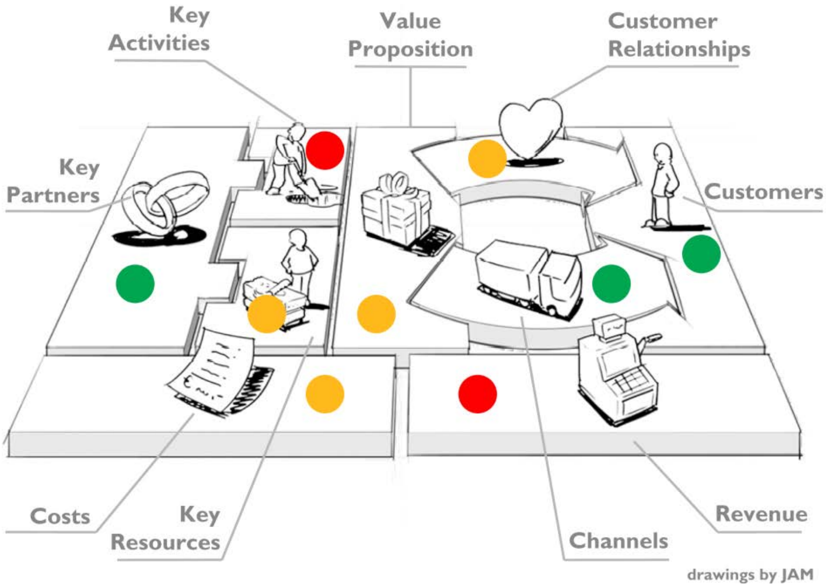

Figure 4.2-1: Business model canvas of Enexis
Source: van Dijck (2015)

When applying the business model canvas to Enexis, the main parts where a discrepancy is foreseen are highlighted by the project team (van Dijck, 2015, p. 12) in figure 4.2-1. Enexis has taken the business model canvas and for each of the points under the categories they ranked the susceptibility to change on a scale from 1 (low susceptibility, green colour) to 5 (high susceptibility, red colour). The ranking is included in appendix H. As can be seen, some components of the business model are argued to have a high susceptibility to change in the coming years (coloured red). Uncertainties arise most notably at the value proposition of the firm, corresponding key activities, and revenue streams. Each component of the canvas is discussed individually.

Enexis' key activities resolve around (1) constructing and maintaining electricity and gas networks, (2) risk based asset management, (3) market facilitation, (4) delivering measuring data, and (5) reducing net loss. Activity related uncertainties are related to the changing way in which the power grids are both owned and maintained (pilots have started with privately-owned grids) and the way measuring data is both collected and used.

In terms of revenue streams, Enexis is dependent on (1) single payments for connection to the grid by consumers (both regulated and non-regulated), and (2) periodical payments for connection to the grid (both regulated and non-regulated). The distinction regulated – non-regulated is made between consumer market and business market: the consumer market is regulated (and operated out of Enexis BV), whilst the business market is non-regulated (and operated by the subsidiary Fudura). Uncertainties arise here with the changing energy landscape – when consumers go off-grid or request a smaller connection, the revenue out of tariffs decrease and/or public support for socialised costs declines.

The overall value proposition of Enexis focusses on the delivery of a reliable and affordable energy infrastructure. This value proposition is reflected in the four strategic pillars Enexis has laid out in their strategic plan for 2015-2020 (Enexis, 2015a). Their value proposition is operationalised into 8 strategic goals: (1) Reliability of the grid, (2) access to the grid, (3) lowest tariffs, (4) transparent firm, (5) customer ease, (6) firm accessibility, (7) sustainable, and (8) delivering custom-based solutions. Uncertainties relate to the fact that the firm is government mandated; a new mandate can shift the value proposition. Also, customer intimacy is of vital importance for the firm, making any customer related value proposition susceptive to change.

On the field of key assets, the firm employs the physical infrastructure, which has a long life cycle and associated maintenance costs and material. A second resource is part tangible part intangible: the IT infrastructure of the grid. A third large resource is intellectual: IT and technical staff. Enexis foresees uncertainties on these intellectual resources. For staff, both the number of employees and the quality of their competences and flexibility are uncertain and susceptible to change when working relations and labour agreements change. The role of IT is also still uncertain in the core activity of the DSO, creating uncertainties on the implications of an increase in the use of IT in the physical infrastructure.

The cost structure of Enexis also knows some uncertainties. Primary costs for Enexis include (1) net driven investments (including depreciation & interest), (2) loans, (3) net loss, (4) buildings, mobility, logistics, (4) IT systems, (5) outsourcing, (6) customer driven investments (including depreciation & interest), and (7) licences. Uncertainties arise at investments (both net driven and customer driven), and the cost of IT (as the use of IT is susceptible to change).

Customer relations are segmented into 4 categories: (1) customer self-service, (2) service-on-demand / self-service for the business market, (3) targeted services, and (4) personal services. The energy transition requires a vivid dialogue with customers, making the relations a primary concern of the firm. As a firm with a public face the relations with customers need to be exemplary.

On the fields of key partners, distribution channels and customers Enexis does not foresee (a high degree) of uncertainty. There are enough customers who require access to the energy grid, enough ways to communicate with the customer, and enough partners to work with.

4.3 Networks and collaborations

Enexis is engaged in multiple networks and collaborations, in which they work together with other DSOs, market parties and educational / research institutes. They are a member of multiple industry associations as shown in table 4.3-1.

Association	Description
Netbeheer Nederland	Industry association for Dutch DSOs
Energie Data Services Nederland (EDSN)	Executing institution for the support of the free energy market in the Netherlands
Nederlandse vereniging voor Sleufloze Technieken en Toepassingen (NSTT)	Collaboration for the development of trenchless technologies and applications
Europees Centrum voor Economische Ontwikkeling	CEDEC
EURELECTRIC	(Electricity for Europe)
DutchPower	Platform for entrepreneurial firms in the energy sector
Energie Nederland	Cooperation of energy producers, traders, and retailers in the Netherlands
VEMW	Knowledge institute and interest group for business energy- and water users

Table 4.3-1: list of industry associations Enexis is member of
Source: Enexis (2015j)

Enexis also actively collaborates in multi-company projects in which different expert views are combined. Examples of these collaborations are the foundation ‘E-Laad.nl’, ‘energieveilig.nl’, ‘consuwijzer’, and the ‘smart energy collective’. All collaborations are contract based agreements, focussing on joint R&D, joint marketing, or knowledge exchanges.

4.4 Enexis’ current strategic position

To answer the first sub question “What is the current strategic position of Enexis”; Enexis is a core company of the energy market and energy network. They distribute energy and are the key players to keep the energy flow going. The DSO is the linking factor between energy production and the end user and as such, they are connected to almost any stakeholder within the energy network. Next to their core activities (maintenance and construction of the energy grids), they are involved in other sub-markets with market players to run pilots with smart grids, electrical transportation, and energy efficiency standards in (private) housing.

The firm operates on both regulated markets and non-regulated markets. For their regulated activities Enexis occupies a monopoly position; however they choose to position themselves as a social DSO, acting in the interest of its customers. Within the boundaries set by regulation Enexis chooses their interpretation and acts as a societal firm. For their non-regulated activities Enexis needs to compete with market parties for customers using the subsidiary Fudura.

When laying these strategies on the value strategy framework of Treacy & Wiersema (1997), Enexis emphasizes on a customer intimacy value strategy, but also puts effort in operational excellence and product leadership value strategies. Their core strategic operational ‘pillars’ of reliability, affordability, sustainability, and customer focus all fall into the three value strategies.

Enexis then positions itself as a social DSO, working in favour of their customers, within the boundaries set out by their government mandate.

<table>
<tr><th>Key partners</th><th>Key activities</th><th>Value proposition</th><th>Customer relations</th><th>Customer Segments</th></tr>
<tr>
<td rowspan="3">Contractors
Combi partners (cable and water companies)
Municipalities (permits)
Suppliers of assets and components
ICT suppliers
Educational institutes
Other DSOs
Energy suppliers (billing)
Other service providers (ODA); among others measuring services
Energy corporations</td>
<td>Building and maintaining the electricity grid and gas net (and solve malfunctions)
Risk based asset management
Market facilitation: deliver data to suppliers. Allocation and reconciliation
Make measuring data available (Fudura)
Reduce net losses: fraud and technical loss</td>
<td rowspan="3">Always available (Reliability)
Access to the grid (Reliability)
Lowest tariffs (Affordability)
Transparency (Customer focus)
Ease of access / use (Customer focus)
Approachability (Customer focus)
Meeting local needs (Sustainability)
Offering custom solutions (Sustainability)</td>
<td>Self-service (Consumers) remote service and self-service (Business market)
Targeted remote services (Active precursors and versatile market)
personal services (Large customers)</td>
<td rowspan="3">Consumers (including energy aware)
Business market: basic customer
Business market: large customers
active precursors and versatile market: smart energy users
active precursors and versatile market: multi-site customer
active precursors and versatile market: contractors and developers
active precursors and versatile market: (semi) governments
Large customers: Market gardeners
Large customers: strategic government partners
Large customers: large industries, health care facilities</td>
</tr>
<tr><th>Key resources</th><th>Distribution Channels</th></tr>
<tr>
<td>Assets: electricity grid and gas net with all components
IT systems
Financial means
Personnel: technical and IT (numbers)
Personnel: Do we have the right competences and flexibility (quality)
Access to capital</td>
<td>interferences and connection issues: telephone, website and app
(measuring) data: internet
Customers: telephone, internet, account management
Small consumption: energy suppliers</td>
</tr>
<tr><th colspan="2">Cost structure</th><th colspan="3">Revenue streams</th></tr>
<tr>
<td colspan="2">Net driven investments: depreciation and financing of assets
Personnel costs — Net losses
Buildings, mobility, logistics — IT systems
Subcontracted work
Customer driven investments: depreciation and financing of assets
Sufferance and permits</td>
<td colspan="3">One-time payment (connection) regulated
One-time payment (connection) non-regulated
Periodical (yearly) tariff regulated
Periodical (yearly) tariff non-regulated</td>
</tr>
</table>

4.4-1: Current Business model canvas for the DSO


ajax

5

Environment analysis

Chapter V – Environment analysis

Like most other markets, the energy market is trend-sensitive. In order to create compelling scenarios later on, trends and driving forces are identified and clustered. This chapter will follow the path from trend discovery, through trend clustering, cross-impact analysis, expert survey results, uncertainty matrix, and finally resulting in a scenario matrix, as depicted in figure 5.0-1.

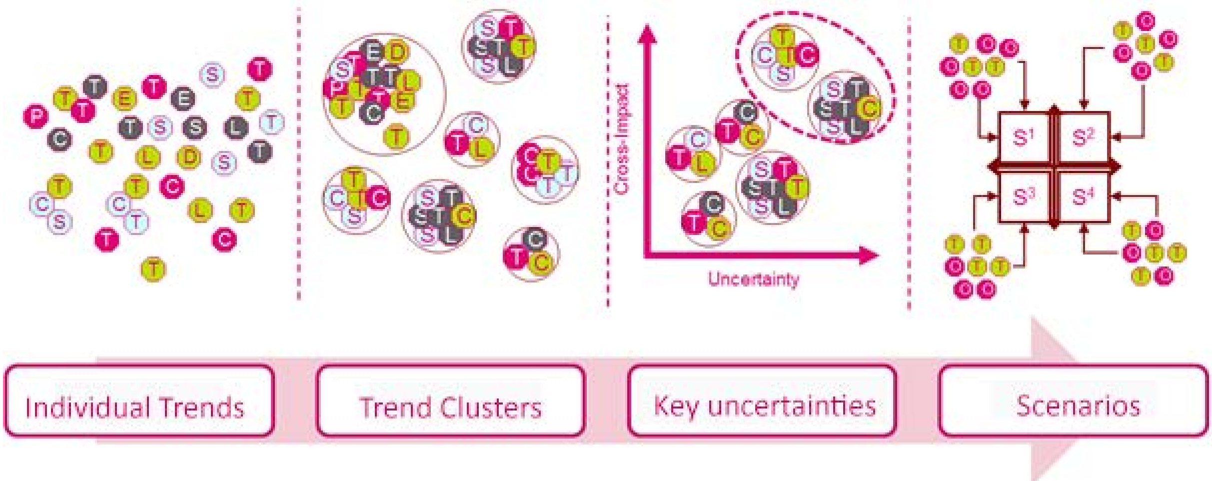

Figure 5.0-1: Trend analysis process
Source: Enexis workbook

5.1 Trends and clusters

Trends on the energy market are identified using a variety of reports by leading organisations on the market, together with the professional opinion of selected experts[9]. A total of 909 trends are found using the data collection methods[10]. All trends have been clustered based on correlation, category, or impact, resulting in the following 29 trend clusters and their most correlated category:

Trend cluster name	Overall category
1. Acceleration of technological breakthroughs New technological developments emerge for existing technologies (efficiency rises?)	Technical
2. Increase of affordable and available energy storage possibilities Storage and conversion to energy carriers which can be relatively easily stored.	Technical
3. Increase in large-scale (central) sustainable electrical production Shifts between energy carriers (electricity, gas, heat) in the central energy production.	Technical
4. Increase in decentralized energy production Production shifts from centralized production to decentralized production.	Social
5. Increasing awareness / attention for sustainability There's an increased awareness and attention to sustainability, both intrinsic at consumer as stimulated by the government (in the form of subsidies, CO2 taxes)	Social
6. Increasing scarcity of resources Resources like fossil fuels and raw metals become scarce. Also there's a shortage of room for the production of biofuels. The result is a price increase of resources.	Economical
7. Increasing complexity of energy distribution Due to changes in supply and demand the requirements to the physical energy network change. The networks become more complex, among others due to the increase in the usage of IT in the networks.	Technical

[9] See chapter 3.3
[10] A full list of trends is included in appendix I.

Trend cluster name	Overall category
8. Increase in the amount of new energy services and service providers There is an increase in service providers on the field of energy and a corresponding increase in the amount of services which can be provided. Developments at service providers are speeding up (energy savings, demand-side management, flexibility)	Economical
9. Decreasing energy usage of the end user / client Energy usage in the residential sector decreases, on the one hand due to better insulation and local energy generation, on the other hand due to increasing energy awareness. There are more and more energy users in and around the house which could make the energy usage 'behind the meter' rise.	Social
10. Increasing customer involvement with energy Energy becomes more important. Customers are consequently more demanding and expect more from DSOs in terms of information, service etc.	Social
11. Increasing urbanisation and shrink regions Urbanisation and shrink regions change demands in investments in these regions.	Economical
12. Economic model develops towards more bottom-up initiatives There are more and more local and small-scale initiatives, in which ownership and usage are handled differently. Examples are the participation-sharing economy and crowd/funding	Economical
13. Increasing instability of global financial systems Integration of global financial markets expands local problems to a larger area.	Economical
14. Increasing desire for meaningfulness The public debate shift from doing the things right, to doing the right things. This leads to different choices on the balance of work and the private environment.	Social
15. Increasing government steering / regulation on the energy market Energy is becoming an important topic in politics. As a result the government interferes more on security of supply. Regulation increases both nationally and from the EU.	Political
16. Increasing flexibility of the labour market Legal principles of fixed contracts and freelancers are more and more similar. More and more people have a flexible working relation.	Economical
17. Sustainable transport rises As the transport sector is required to become sustainable, a shift occurs towards transportation with no direct fossil fuel usage. Electric vehicles, hydrogen vehicles and transport based on green gas rises.	Technical
18. Increase in public involvement with energy related questions The public is more involved with projects concerning storage, gas, CO2 collectors etc. and also carries strong opinions on them.	Social
19. Increasing desire for self-sufficiency Increase in human (individual) independence of existing institutions. Self-sufficiency is a priority	Social
20. Increase in number (and tasks) of energy corporations Collective self-sufficiency rises; tasks and complexity of corporations will increase, from production to distribution and delivery.	Economical
21. Emergence of new energy carriers / forms of energy Among others nuclear fusion, LNG, biogas, shale gas, ´heat´ as source, hydrogen.	Technical
22. Increasing need for flexibility to account for fluctuations in energy supply and demand Increasing need for controllable generation and controllable usage for a better fine-tuning of variable supply and demand. Examples are controllable generation and dynamic tariffs.	Technical
23. Increase in the importance and usage of data The amount of data and the connection between data from various sources are increasingly more important, providing options for new forms of services and monitoring.	Technical
24. Increasing contradictions in the society Increasing contradictions arise between 'have's' and 'have-not's'. For a growing group of people access to new digital applications is becoming a problem; the energy bill threatens to become too expensive.	Social

Trend cluster name	Overall category
25. Increase in geopolitical unrest This can lead to new collaborative efforts and / or more need for self-sufficiency.	Political
26. Increase in specialisation and collaboration in / over the value chain Through increasing complexity in the energy value chain and specialisation of firms there is an increasing need for interdependence.	Economical
27. Emergence of the (bio-based) circular economy Increasing scarcity of resources lead to the emergence of a circular and bio-based economy. Renewability and reusability of resources are key.	Economical
28. Increase in integration between electric, gas, and heat through local optimisation More often than not people look for the best solution on a local level by integrating energy carriers.	Technical
29. Increase in aging population The aging population leads to a labour shortage and requires firm attention to the field of customer communication.	Social

Table 5.1-1: Identified trend clusters

The second sub question "*Which aspects and trends have a high probability of uncertainty and importance within the next decade?*" then describes the 29 trend clusters found above. The clusters range between all trend categories used, and describe both macro and micro trends. In the macro environment, most clusters resolve around (geo) political and financial issues. On a micro level, trends resolve mostly around technological developments and behavioural changes towards a more self-sufficient perspective. On average, each trend cluster is based on 31 individual trends. An interesting conclusion is that the clusters themselves are rather clearly defined, with specific descriptions and assumptions. When doing scenario analysis, one could argue that descriptions are rather vague due to the uncertainty involved in future studies. The trends found however all distinguished clear direction and magnitude making the clusters also clearly defined and directed. All trend clusters are used as input for the next step: the cross-impact analysis and the expert survey.

5.2 Cross-impact analysis and expert survey

The cross-impact analysis first has been filled during an expert workshop on March 26 with members of the project team (n = 7). The sample is kept in-house and small due to the vastness of options to fill (29 clusters offset against each other results in a matrix comprised of a total of 29 x 29 = 841 boxes to fill). Reliability is also served by this large amount of options. All members have more than sufficient knowledge concerning the trend clusters to make a valid assessment of the cross-impact of one cluster on another. All trend clusters are set against each other to assess the impact of the first on the second on a scale from 0 to 3. The row mean (CI-score) gives the average impact of that cluster on all others; whilst the column mean gives the average impact other clusters have on the focal cluster. Both the average CI-score and the average dependency-score rest at 0.9. The full cross-impact matrix is included in appendix J.

For the expert survey a sample of 28 was selected of all project team members and the entire board of directors. The survey is kept in-house in order to accommodate the survey within a very short period of time (5 days) and because the size of the sample should prevent any reliability issues, as all respondents have sufficient knowledge on the energy market. All respondents were asked to rank both impact and uncertainty of all 29 trend clusters on a scale from 1 (very low impact / very low uncertainty) to 5 (very high impact / very high uncertainty). Response rate is 90%; 25 respondents answered the questionnaire. The average uncertainty is 2.75; the average individual impact is 3.57. The results of both the cross-impact matrix and the expert survey are provided in table 5.2-1. The survey results are included in appendix K.

	Trend cluster	Cross impact	Uncertainty	Impact
1	Acceleration of technological breakthroughs	1,3	2,48	4,20
2	Increase of affordable and available energy storage possibilities	1,6	2,60	4,44
3	Increase in large-scale (central) sustainable electrical production	1,0	2,60	3,52
4	Increase in decentralized energy production	1,6	2,28	4,24
5	Increasing awareness / attention for sustainability	1,4	2,60	3,20
6	Increasing scarcity of resources	1,4	2,92	3,40
7	Increasing complexity of energy distribution	0,5	2,24	4,16
8	Increase in the amount of new energy services and service providers	1,1	2,96	3,60
9	Decreasing energy usage of the end user / client	0,6	2,20	3,28
10	Increasing customer involvement with energy	1,1	2,36	3,28
11	Increasing urbanisation and shrink regions	0,5	2,32	3,60
12	Economic model develops towards more bottom-up initiatives	0,9	2,96	3,12
13	Increasing instability of global financial systems	0,8	3,40	2,88
14	Increasing quest for meaningfulness	1,2	2,92	2,96
15	Increasing government steering / regulation on the energy market	1,0	3,16	4,04
16	Increasing flexibility of the labour market	0,4	2,64	2,76
17	Sustainable transport rises	1,3	3,12	4,00
18	Increase in public involvement with energy related questions	0,6	3,04	3,32
19	Increasing desire for self-sufficiency	1,2	3,12	3,80
20	Increase in number (and tasks) of energy corporations	1,1	3,32	3,73
21	Emergence of new energy carriers / forms of energy	0,9	3,16	3,76
22	Increasing need for flexibility to account for fluctuations in energy supply and demand	1,2	2,52	4,08
23	Increase in the importance and usage of data	0,8	1,96	4,08
24	Increasing contradictions in the society	0,5	2,92	3,08
25	Increase in geopolitical unrest	0,6	3,44	3,64
26	Increase in specialisation and collaboration in / over the value chain	0,6	3,00	3,68
27	Emergence of the (bio-based) circular economy	0,9	2,76	2,80
28	Increase in integration between electric, gas, and heat through local optimisation	0,8	3,04	3,72
29	Increase in aging population	0,4	1,80	3,12
	Averages	**0,9**	**2,75**	**3,57**

Table 5.2-1: Trend cluster uncertainty and impact scores

In summary:

- The cross-impact score depicts to what extent the given trend cluster has an impact on other trend clusters; i.e. it is a driver for change.
- Uncertainty refers to the uncertainty accompanying the trend; i.e. how certain it is the trend develops in the direction stated.
- Impact refers to the overall impact the trend cluster will have on Enexis.

5.3 Core uncertainties

The survey results are two values for each trend cluster: the uncertainty of the cluster, and the individual impact of the cluster. These two are used as input for the uncertainty matrix as shown in figure 5.3-1. As the cluster names are too long to use in an effective way in a graph, the trend numbers are used to create an overview of the cluster's uncertainty and impact. The axes of the uncertainty matrix are represented by the two variables provided by the expert survey: uncertainty (Y-axis) and individual impact (X-axis). The method calls for the most uncertain and most impactful trend clusters. The average scores are used to determine the quadrants of the matrix; one the clusters which score above average on uncertainty and impact are eligible for use as a scenario axis. This uncertainty matrix is used as a filter in order to categorize clusters on uncertainty and impact.

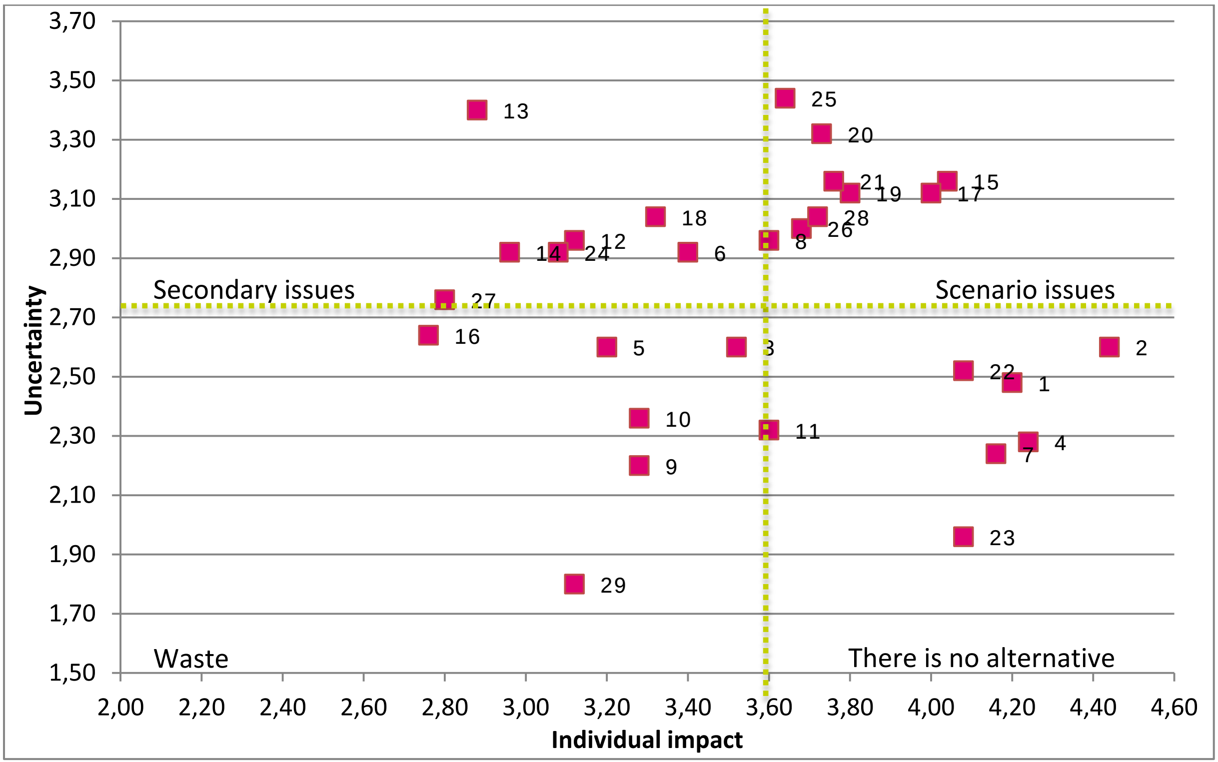

Figure 5.3-1: Uncertainty / importance matrix

Following the figure, the quadrant 'scenario issues' encompass those trend cluster fit for using as key uncertainties. These are listed shown in table 5.3-2. The CIM second results into an aggregate average of the interdependency of the clusters. This aggregate score of each cluster states the average dependency of other clusters on the focal cluster, which are used to weight each potential axis-cluster.

No.	Trend cluster name	Category	CI-score	Dependency
8	Increase in the amount of new energy services and service providers	Economical	1,1	1,50
15	more government steering on the energy market	Political	1	1,39
17	Sustainable transport rises	Technical	1,3	1,04
19	Increasing desire for self-sufficiency	Social	1,2	0,96
20	Increase in number (and tasks) of energy corporations	Economical	1,1	1,14
21	emergence of new energy carriers / forms of energy	Technical	0,9	0,96
25	Increase in geopolitical unrest	Political	0,6	0,64
26	Increase in specialisation and collaboration in / over the value chain	Economical	0,6	1,07
28	Increase in integration between electric, gas, and heat through local optimisation	Technical	0,8	1,32

Table 5.3-2: CI-score and dependency score for selected scenario issues

The CI-score of the selected trend clusters are all well above the average CI score (0.9), leading to believe all clusters have potential as key uncertainty / scenario axis. Usability of trend clusters is discussed by applying background information on the clusters and linking them to the main research question.

First, clusters 8 and 20 can to some extent be considered similar as energy corporations are energy service providers. Cluster 20 also sharing some overlap with 19 (in the sense of decreasing overall scale from national / large corporations to local / smaller corporations), leading to the dropping of cluster 20. Second, clusters 21, 25, 26, and 28 can be disregarded as they have an average or lower cross-impact score. Cluster 15 has not a strong connection with the strategic question, therefore also disregarded. The selection criteria then argue that clusters 8, 17, and 19 are potential key uncertainties which can be used as scenario axes.

5.4 Scenario matrix

When selecting scenario axes, it is desirable to select one axis which enables realistic world views by describing a global or societal uncertain driver, and a second axis which describes a more concrete uncertainty to provide a sufficient amount of detail into each world view, enabling the creation of distinct scenarios which can be used for strategic insights. The three scenario issues which are eligible for axis selection are:

- 8 Increase in the amount of new energy services and service providers
- 17 Sustainable transport rises
- 19 Increasing desire for self-sufficiency

Of these, cluster 19 describes a societal driver which can enable realistic world views. Clusters 8 and 17 are economical and technical in nature, making them perfect for a concrete axis. Two scenario matrices were created in order to assess the feasibility of both matrices for the creation of good scenarios; one matrix consisting of clusters 8 and 19, the other matrix consisting of clusters 17 and 19. Using the second matrix not all identified trends and driving forces had a distinct and qualitative place within scenario narratives, thus not leading to coherent, distinct, and probable scenarios.

To this end cluster 19 “Increasing desire for self-sufficiency” is selected as the primary X-axis, and cluster 8 “increase in the amount of new energy services and service providers” as primary Y-axis. The combination of these two key uncertainties makes it possible to lay all other clusters onto and create distinct, but possible scenarios with a vivid narrative. This selection results in the scenario axes depicted in figure 5.4-1. It is important to note that all trend clusters are used within the content of the scenarios; as all trends are, to some extent and uncertainty, happening. The selection of the two trend clusters as key uncertainties enables the creation of four highly distinct, but possible futures.

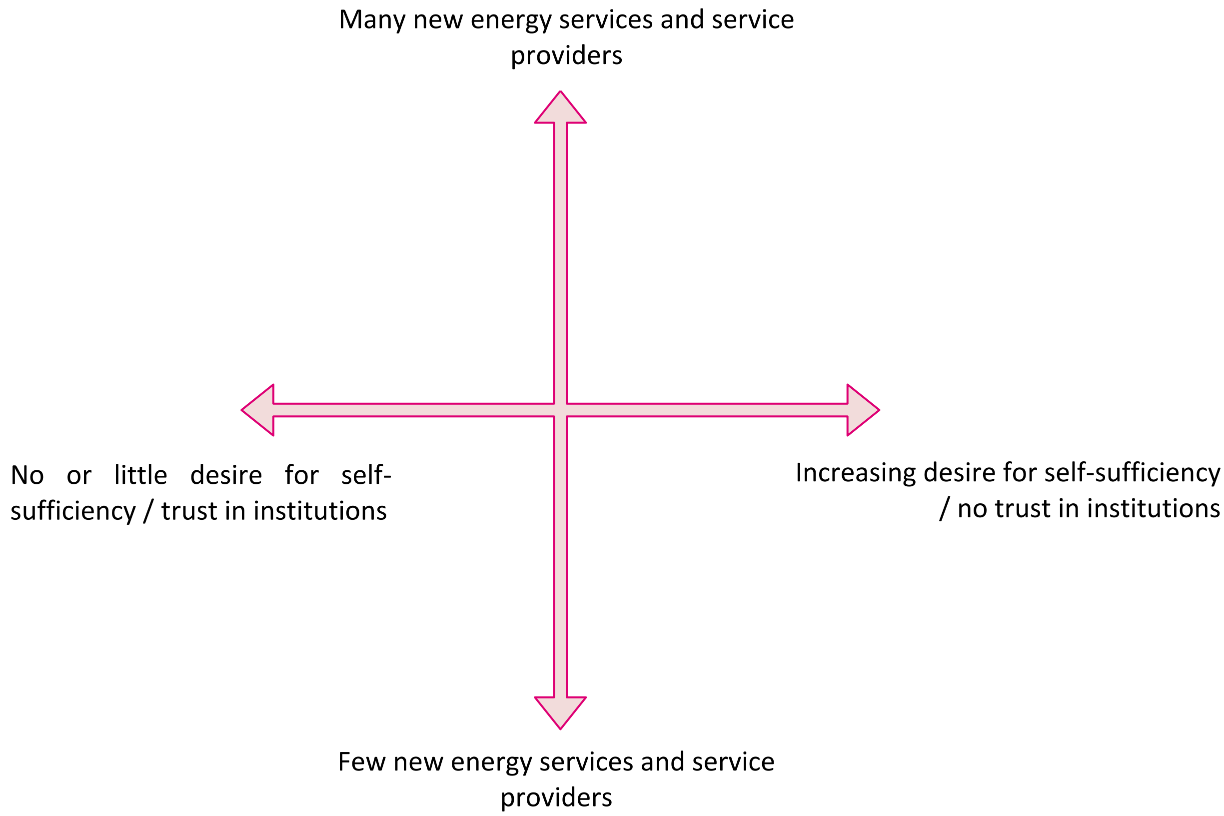

Figure 5.4-1: Scenario axes

6

Scenario narratives

Chapter VI - Scenario narratives

After the environmental analysis and the establishment of the scenario axes, the individual scenarios are filled to create four vivid, plausible, differentiated, and consistent scenarios (Wilson, 1998). This chapter will elaborate each scenario and discuss the views embedded in them. The chapter will start with providing the scenario matrix and corresponding scenario labels, followed by a short summary of the starting point for each scenario: the present. Each scenario is discussed in its own section, concluding with an overview of autonomous trends overall findings. Within each scenario is a story-driven "road to" chapter; which enables the reader to get a feeling for the world which is described and how such a world can manifest. *They are not based upon scientific material and therefore fiction.*

6.1 Scenario matrix

Based upon the two key uncertainties 'Desire for self-sufficiency' and 'new energy services and service providers', the scenario matrix leads way to four distinct scenarios. Scenario labels are formed using creative thinking and trend cluster association. The fourth sub question "Which scenarios can be constructed based on found leading indicators" is answered by figure 6.1-1 below: four scenarios can be constructed, which are elaborated in this chapter.

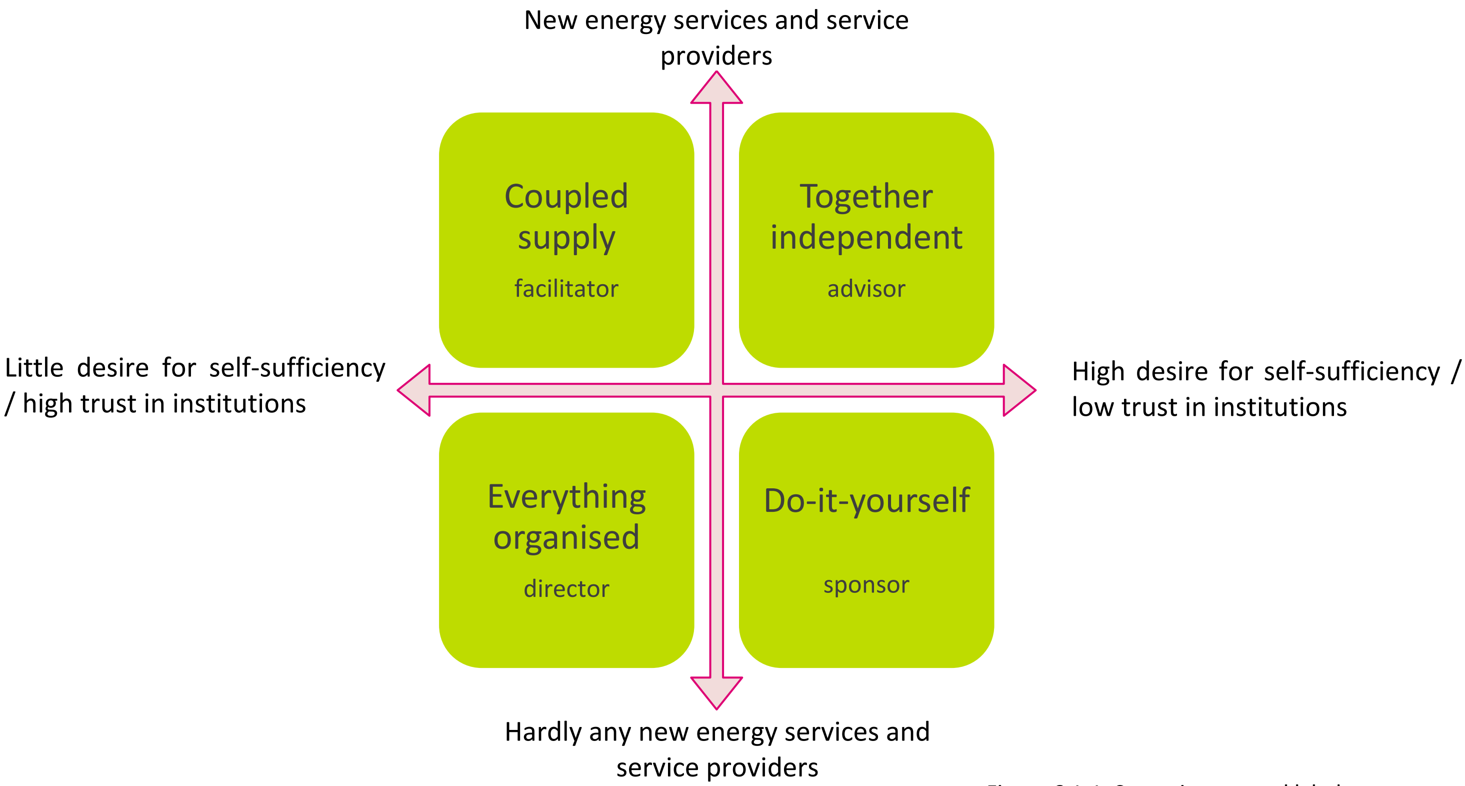

Figure 6.1-1: Scenario axes and labels

The scenarios have a narrative which distinguishes trends on multiple levels. These narratives will include (1) management summary, (2) the road to, and (3) an elaboration of the year 2030.

To better understand the road to 2030 and the world in 2030, an assessment of the current world is made. At the beginning of the 21st century, three distinct events took place. First, Lehman Brothers went bankrupt in 2008, triggering a global financial crisis. This crisis severely damaged the consumer trust in institutions like banks. Second, the debt crisis which started in 2010 marked the beginning of a savings-spree by national governments, creating unrest under the population. European collaboration and solidarity became subject to scrutiny due to the financial statuses of EU member states. The third important event is increasing global instability beginning as the 'Arab Spring', and resulting in the founding of Islamic State (IS). The continuation of IS within the region stresses the international community and creates fear throughout the world. Also, As a consequence to the shooting down of international flight MH-17 by presumably Ukrainian separatists, tensions between Russia and Europe rise sharply. Next to these developments, technology is increasingly becoming more important in daily life.

6.2 Scenario #1: Coupled supply

It is 2030. Welcome in a world where citizens have renewed faith in institutions and the energy market is transformed due to the entry of many new services and service providers. Most international conflicts have been resolved by international coalitions. A new European enthusiasm has emerged, strengthening the European Union (EU). A European infrastructure has been established, connecting energy transmission grids and transport networks of all member states. Europe provides a framework within this new system to enable regional governments and DSOs within member states to choose an energy solution most fitting to the regions characteristics, within a European energy system. Power by heat is widely introduced as energy carrier. A singular European financial system and equal facilities like education ensure stability within the EU. This stability provides a feeding ground for new services and service providers to flourish on a variety of fields, mostly distributed via existing, reliable distribution channels and brands. The Energy Union has been established; the Netherlands have a function as primary gas intersection for the entire EU. The Netherlands are primarily used as renewable wind production region within the EU, whilst Norway provides power by water, and Spain thrives on solar energy. New energy grids are constructed and maintained in public-private collaborations.

6.2.1 The prelude: 2015 – 2019

Initially, unrest in the world rises. Putin has entered his fourth term as President of Russia in 2018. IS has expanded further into the Middle East, resulting in increasing refugee flows towards Europa, Africa and Southwest Asia. Some major oil fields in the Middle East are conquered by IS, making oil more than ever a reason to fight. Europe decided to stop oil imports from the Middle East. The mildly recovering EU economy relapses, resulting in a new economic crisis for EU member states.

Tensions within Europe rise as a result of poor economic conditions, increased unemployment rates, and problems related to refugees. Solidarity between Northern Europe and Southern Europe and between Western Europe and Eastern Europe decreases. Europe's position on the global market deteriorates. Germany, the Netherlands, France and the Scandinavian countries form a pact to strengthen the position of Europe on the global market. Southern EU countries, fighting against bankruptcy, are taken in by the Northern Pact after tough negotiations. The renewed convergence between member states provides opportunities for collaborations between knowledge institutes, governments, and businesses.

Large institutions offer small innovative parties a platform to market their new, creative solutions. The national deployment of smart meters, together with distribution automation, creates a giant flow of real-time information, which the DSO releases free of charge to the market. By this release of free information and data, partnerships arise with large-scale opportunity driven R&D. The results of these partnerships are some technological breakthroughs, for example on large-scale energy storage solutions, making among others hydrogen and power to gas initiatives profitable. Customers choose more often for a sustainable energy producer due to being more sustainable energy producers available. Also, Energy management systems emerge to 'solve' the flexibility question.

The role of 'The Hague' is strongly reduced due to increasingly stable, important, and region-focused European policy. The energy system is more and more resolved locally using local energy sources. Trust in institutions and governments rises due to the local level decision making. Municipalities and regional DSOs, together with possible local energy cooperation's, decide what the best energy supply is in a region. The dialogue between regional government and citizens on utilization of locally available energy sources provide an incentive for heat as energy carrier. DSOs emphasize the preservation of existing energy grids and are reluctant to construct new grids. Regulation by national and regional governments realizes large amounts of central renewable energy production, mostly gained using wind energy. Generation spikes cause more and more trouble for the power grid, increasing the call for a flexible power grid and / or storage facilities towards 2020. New market parties emerge to offer this flexibility as their business case. The energy market is set out on an intermediating change trajectory as the core activities of DSOs are threatened due to the addition of new market parties.

6.2.2 The interlude: 2020 – 2029

Global and European issues more and more require international collaboration. The United Nations Security Council passes a resolution allowing large scale military intervention in the Middle East. Iran joins the grand coalition against IS. EU member states join under a unified EU flag (France and Britain combine their own seats in the Security Council to form a single European seat). The immediate result of this unification is the enactment of a European army.

The EU and member states increasingly collaborate to stimulate their economies. Activities like infrastructure, energy, and defence are handled on EU level. Member states keep regulatory space to enact policy at their discretion. The Dutch economy recovers slowly under influence of the EU and increasing political peace. This economic growth continues into the second half of the 20s, resulting in talks of growth across Europe.

The Energy Union is fully operational in 2022. The integral European energy market combines energy production facilities in the entire EU in order to meet EU energy demand. Local sources are used to meet local demand, with surpluses and shortages balanced through a European energy grid. Using large-scale sustainable energy sources is more profitable, efficient, and reliable than creating a personal solution for consumers. In the Netherlands part of funding for large-scale solutions come from the abolition of the netting agreement (Dutch: salderingsregeling). On a regional level provinces, together with municipalities and energy suppliers, initiate these solutions, supported by innovative service providers and technology firms, for instance on the field of energy management solutions and home automation. A wide variety of multi-functional solutions are presented to consumers and industries in which services like living, health care and transport are integrated.

Collaboration between government and market increases. The market is allowed a lot of room for innovative solutions on the field of energy and the DSO steers together with market parties on flexibility. DSOs are starting to act as System Operators who optimize every region by searching for a fitting, integrated energy supply. In this they are spiders in the web of the energy market who guarantee transparency of data and a quality consideration of societal interests of all new service providers.

Stronger emission standards of the EU result in an 80% sustainable transport sector in Europe, in which the mobility mix consists mostly of electrical vehicles. During the 2020s self-driving cars are legally allowed on public roads; highways are more and more characterized by both these cars and 'Superned' loading terminals. Heavy road transports are improved by building trolley rails in highways, and are powered by biofuels. Public transport has developed into 'mobility menus' in which sustainable individual transportation is integrated by large service providers like Google Wheels and Uber.

6.2.3 The finale: The world in 2030

The world in the scenario 'coupled supply' is characterized by stable politics and economics. Consumers have regained their faith in institutions. Policy makers create regulatory space on the energy market to harmonize supply and demand and facilitate optimal solutions. The DSO has an important coordinating role. Due to the quality of regional collaborations between regional governments, DSOs, and companies, energy remains a low-interest product for consumers. Consumers are not engaged with energy savings and individual energy generation is not profitable enough to justify the effort. Total energy usage rises due to an increase in the usage of electrical vehicles.

The energy market combines economies of scale, together with several mergers and take-overs of energy giants, power plants far from major consumption centres and cross-border energy flows, with regional solutions with a sustainable nature. The liberalization of the energy market enables the usage of dynamical energy tariffs.

Many large-scale renewable power generation stations are available in Europe. The best energy supply solution is chosen considering regional characteristics. Southern countries use much solar energy, whilst the Netherlands focuses on wind energy and blue energy (an earlier technological breakthrough, energy from water), and whilst Norway is powered by water power plants. Renewable production is mostly centrally produced due to European coordination. Large-scale energy storage systems (power to gas, LNG, ammonia-storage) are subject of a large variety of services like trade on the wholesale market, balancing of the energy market on EU-level, congestion management on the grid, and to realise extra usage of renewables.

Throughout the value chain new companies and services arise focussing on sustainability and affordability for both the consumer and business markets. Innovation power and creativity of start-ups are combined with the experience, data, image and finances of large firms. DSOs guard public interest together with the government to enable a transparent market by creating a framework for third party services. They create digital platforms to offer these services, for example controlling smart products on both small (household) and large scale (industry scale).

Heat is introduced on a national scale as energy carrier, making gas more and more a back-up carrier. The Dutch gas network is used as gas interception of Europe. At the end-of-life of gas pipes, they are not automatically replaced. Newly build neighbourhoods are mostly supplied by residual heat or heat pumps. Focus on delivery for both consumers and industries lies in the offering of a service / function (deliver light instead of lamps). Customers do not care how his home is heated, as long as it is heated.

Existing energy grids remain property of DSOs. Locally new grids are constructed on initiative of a cooperation or municipality, at which the ownership of the grid lies at the initiator. The DSO has two key activities: grid maintenance, and providing advices on energy for both the consumer and business markets. Municipalities and provinces decide together with the DSO how the energy system, and its corresponding infrastructure, can best be designed at the local level. The energy system costs are locally socialised. The DSO directs the efforts of public and private parties within an integrated energy system, facilitating sufficient room for new energy demands, carriers, and production. To accommodate this new role, new collaborations emerge with existing DSOs and new firms. The DSO also facilitates reserve capacity on the energy grids out of fossil sources in times that renewable sources are insufficient. Firms increasingly collaborate throughout the value chain. These collaborations take shape as strategic alliances in order to share resources and optimize work flows between specialised firms. These alliances are mostly based upon contractual agreements and trust in these relationships.

The government has created important regulatory conditions to handle privacy-sensitive data based on EU regulation. The DSO is tasked as independent curator of energy measuring data. This data is handed free of charge to the market to form business cases around produced information. Content aggregators facilitate flexibility for the DSO.

6.2.4 Strategic position in Coupled Supply

In a world where the DSO is the director of the central energy supply, and holds an advisory role for the construction of new grids, the firm is operating on both non-regulated and regulated markets. The firm's environment is characterized by a large degree of competitive intensity, an increase in technological turbulence due to the volatility of energy services, and an increase in complexity due to increased heterogeneity of the activities of Enexis. Their resources and capabilities are characterized by an increase in intellectual resources and a slight decrease in technological resources. In this altered landscape Enexis pursues the same strategy as it has since 2015: focusing on operational excellence for grid operations, but supplemented by great effort in customer intimacy strategy in order to connect with their customers and offer and improve custom energy advises.

6.2.5 Business model canvas: DSO as Facilitation Company

In this world of trust in institutions and a low desire for self-sufficiency and many new service providers, the DSO still has an important role to play. They are still the backbone of the energy market in caring for all existing energy grids. New grids are constructed and managed by initiating parties. The DSO is no longer monopolist on the distribution market. They also provide advisory services to both consumer and business markets.

This has a great impact on the key partners of Enexis. Collaboration between market parties and Enexis becomes a primary focus. Municipalities decide in collaboration with the DSO and other market parties how the energy supply can be best managed on a local level. The DSO has more than ever a central role in providing a stable infrastructure and energy supply. Key partners therefore include municipalities, construction companies, energy cooperation's, energy producers, IT suppliers, asset suppliers, and OSPs.

Based upon these new partnerships and collaborations, the key activities of Enexis are appended. The largest new activity is the advisory role the DSO will get. In this role the DSO adds their knowledge to the discussion over the most optimal local energy supply, together with advisory activities when new parties want to construct their own (local) grids.

Enexis' key resources will not change too much in this scenario; their assets still have a primary function and access to capital is not limited. The amount of IT in the grids will rise sharply, making it a primary resource. Staff competences and flexibility is another primary resource, as the advisory role of the DSO requires people with the skills and competences to fulfil this 'new' market role of the DSO and enhance the strategic position based on it.

The value proposition corresponding to Enexis' core activities has traditionally been focussed on their primary role (construction, maintaining, and management of the energy grid). With an additional role as advisory company, the value proposition of the firm is equally expanded. Due to operating on a non-regulated market, the value proposition is more based upon a competitive position than on quality service. Their current business model therefore is appended by the offering of high quality, accessible advice to market parties and governments.

Their value proposition is then distributed to their customers using both current distribution channels and new, direct channels in form of advisory / consulting services.

Customer relations are required to change in order to meet this new value proposition. A more direct approach is needed in order to meet customer demands in a competitive environment. Personal services need to increase against consumer self-service solutions; Enexis needs to be more visible in order to survive in a market in which competition on core activities and core resources exists. The customers themselves have not changed much; they are however more organised via energy cooperation's, increasing their bargaining power.

These changes have an important effect on the cost structure of Enexis. For the costs; net driven investments will reduce due to new grids being constructed in public-private collaborations in which the ownership lies with market parties. Customer driven investments will likely rise in order to meet increased demand for flexibility. IT and loan costs will likely rise too as the new advisory role of the firm asks for more competences and IT systems.

The revenue streams of Enexis will shift as new grids no longer provide a revenue stream. The existing grids will keep providing a revenue stream. A new revenue stream follows the advisory role of the DSO.

These changes are color-coded in figure 6.2-1. Red is strong change, yellow medium change, green no change.

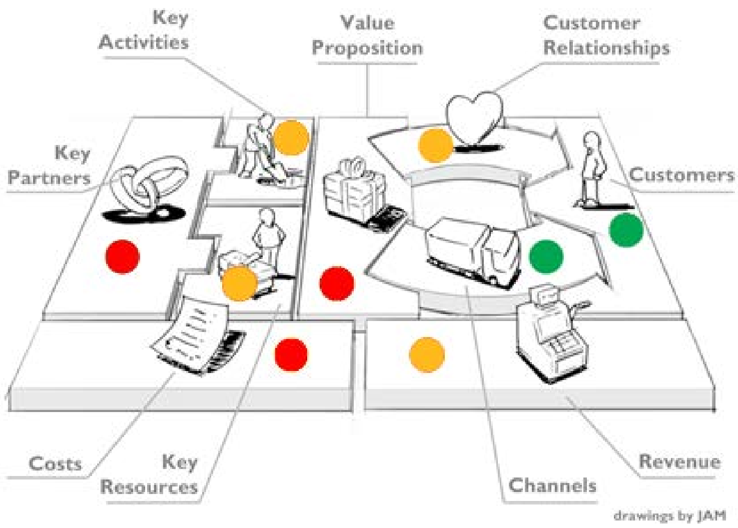

Figure 6.2-1: Business model canvas of the DSO in 'Coupled supply'

6.3 Scenario #2: Together independent

It is 2030. Welcome in a world where citizens choose self-sufficiency and the energy market has been transformed due to the entry of many new service providers. After a long period of geopolitical unrest and the incapacity of global community to quell this unrest, citizen trust has declined to a historical low. People have a desire to become independent of both governments and institutions; to this end they collaborate in local cooperation's. Their primary fields of attention are energy and mobility. To ensure a stable energy supply, consumers and small firms collaborate in energy savings and local, often sustainable, solutions. Energy cooperation's have increased in numbers whilst society has shifted to electrical transportation. Breakthroughs in storage technologies provide possibilities for self-sufficiency which cooperation's use to reduce their independency from the national grid. New energy service providers build upon this 'new' market demand by offering services to locally optimize energy sources, trade energy surpluses online and give saving advises. The market for energy services has become dynamic and competitive, creating competition on the distribution market. Ownership of energy grids has been decoupled from maintenance and construction. Existing grids are handed out in concession to parties who are willing to maintain them. New grids or local solutions are often constructed by market parties, sometimes using an integrated approach with maintenance of for example real estate and / or infrastructure. The existing gas network is not automatically replaced anymore at the end of life.

6.3.1 The prelude: 2015 – 2019

Although the economy in most EU countries grew for the first time since years in 2015, the credit crisis of 2008 had left his mark. Citizen trust in large firms remains at an extremely low point, despite economic growth. Large firms are all confronted by critical customers, who switch energy suppliers on a regular basis. Governments are equally mistrusted. The inability to solve the EU debt crisis leads to a high amount of euro-scepticism and limits the decision power of Europe. The EU decides to focus on the further liberalization of internal markets and announces not to pursue a central economic or foreign policy.

Since geopolitical unrest rises in this period, the crisis in the EU comes at a bad time. The continuous growth of IS in the Middle East and North Africa, together with the Cold War rhetoric's of Russia leads to unrest around the globe. A desire emerges in Western Europe to become independent from gas and oil out of Russia and the Middle East. A strong tendency grows under citizens towards self-sufficiency.

This tendency to self-sufficiency leads to significant changes in market sectors previously dominated by large companies and institutions. Citizens unite in communities and realise local solutions on the field of health care, funding, insurances, and energy, and make data available to each other. The number of energy cooperation's rises sharply on the field of energy. This rise is mostly due to fast, new developed technologies and services. New IT solutions alter and widen the playing field between consumers, industries, small firms, and (energy) market parties. Applications for home automation, energy management, robotics, and smart mobility succeed one another in quick succession. The capacity of PV systems increases rapidly, the field of energy storage knows some quality breakthroughs. The share of renewable energy in the energy mix has risen to above 15% in 2020.

6.3.2 The interlude: 2020 – 2029

The third decade begins with a total blackout in the Netherlands. Energy instantly is put on the political agenda and Dutch citizens are strengthened in their tendency towards self-sufficiency. The government is committed to facilitate a reliable and sustainable energy market, and encourages industry renewal. Robustness of the system is served by the entry of many small new service providers with innovative solutions. Society demands of both existing and new firm's openness and availability of data and information, for example measuring and energy usage data. The government reacts with providing guidelines for the availability and usage of open data. The government keeps ownership of existing energy grids, but outsources maintenance and management to market parties. Regional energy grids are used less and less due to the rise of local energy systems, varying from heat grids to local biogas solutions. The construction of new energy grids is handed to market parties. The government seeks to create a level playing field for new energy service providers. An example is the deployment of open standards and protocols to enable a multitude of solutions. All parties who manage energy grids are required by law to release all data publically available to all market parties.

The EU has concentrated on her core task: the creation of a functional internal market and the regulation of products and services to enforce product quality, safety, and environmental impact. The EU diminishes obstacles to ensure free traffic of capital and labour in order to create a large open market for entrepreneurs. The willingness to invest increases, and with it, technological innovation. Innovative efforts are strengthened by a high CO_2 price, set to reduce dependence of fossil fuels from outside Europe.

In the third decade technological developments follow in rapid succession. In 2025 the cost for consumers to generate their own renewable energy is lower than the cost for grey electricity via the energy grid. The initial investment payback period is no longer a barrier for consumers to switch to their own power generation. New service providers emerge who offer storage subscriptions in combination with the supply and installation of PV panels. The breakthroughs storage technology also means a boost for electrical vehicles. Electrical transportation becomes affordable and many customers choose an electrical car, sometimes sharing it with their neighbours. The energy market is set out on a radical change trajectory, as existing grids are handed out in concession to market parties and new grids are realised in private partnerships.

Slowly the energy supply is electrified. The emergence of renewable, local energy increases difficulty for energy producers. Many major energy producers get caught up in financial trouble due to shrinking oil / gas trade, rising prices of coals, and the declining demand for grey energy from the consumer market. The CO_2 price has also risen sharply. At the end of the third decade all traditional energy producers who managed to survive have downsized and focussed on the industrial market. Industrial customers are increasingly demanding renewable energy. Companies can purchase reserve capacity from conventional power plants (which run as a back-up) because renewable energy is not always in sufficient supply. Suppliers try to collaborate with major industries and industry parks in order to locally meet the energy demand as public support crumbles for these conventional power plants.

6.3.3 The finale: The world in 2030

The world in 'Together independent' is characterised by a strongly transformed energy landscape. Consumers are critical on traditional firms and work on self-sufficiency on neighbourhood level. Industries are transforming. People are more often and faster collaborating in communities for living, caring, doing groceries, handling energy, etc. The sharing economy flourishes: ownership of products and goods are less relevant than access to solutions. Citizens are open towards unburdening. This creates a space for new, locally oriented, collaborations; in these nurturing grounds for innovative firms multidisciplinary combinations emerge which offer new revolutionary products. Products, services, but also energy surpluses are actively traded via new (online) platforms and communities. Local exchanges are facilitated by online platforms which are, paradoxically, often initiated by large firms.

People make sustainable and self-sufficient choices. In part by intrinsic motivation, but also often because the independent choice is in itself more sustainable and affordable. There is a lot of attention for energy efficiency and energy savings. Sustainable transport has fully emerged, in particular electric vehicles. Cars and loading points are actively shared via commercial service providers. Energy demand shifts towards renewable energy. Per household the energy usage has risen. People work flexible; the amount of fixed workstations is severely limited. Collaboration is key and takes place in regional flexible workplaces not affiliated with one firm.

Customers desire self-sufficiency on local level concerning their energy supply. Consumers produce their own energy and are connected in local energy cooperation's who maintain the energy supply on neighbourhood level. Where local production is not possible or profitable, consumers participate in larger scale production, for example wind energy, biogas hubs or geothermal projects. Market parties realise local heat solutions with corresponding infrastructure at existing buildings; new buildings are generally built all-electric. The gas network is maintained for locations where local heat solutions are not profitable or possible, on other places it is no longer automatically replaced at end of life. Companies and groups of companies are increasingly producing their own energy locally, usually via solar or wind energy or biomass. Also, thermal energy storage takes place at many offices and commercial buildings. Some firms hire ESCOs to take care of the complete energy system of their property for a fixed amount in multi-year contracts.

Large, traditional energy suppliers are mostly bankrupt or have radically changed their business model. The remainder serves the industrial markets, or have shifted towards offering local energy services. All have had significant write-offs of their gas and coal power plants, in part to a sharp decrease in demand, in part to being converted to biomass plants. Due to the diversity of customer demands, smaller, specialised firms are flourishing. Firms emerge who offer local renewable energy production for a fixed sum or lease structure. ESCOs offer flexibility and storage solutions for both consumers and energy cooperation's. Service providers emerge who optimize energy flows and sources locally commissioned by cooperation's and municipalities. New firms emerge also who maintain the complete energy system of a neighbourhood or firm for a fixed sum. Specialisation of firms requires a high degree of collaboration throughout the value chain.

Fragmentation of the energy market leads to competition on the distribution market. Existing low voltage grids are handed out in concession by the government to firms willing to manage them. Ownership is decoupled from management and construction. Market parties are offered regulatory space to execute management and construction. Solutions are chosen on a local level based upon the needs and requirements of the local community. Firms actively collaborate in strategic networks in order share research or manufacturing, create economies of scale, or achieving strategic objectives. A central role remains for the DSO to facilitate the market. This role is expanded to maintain connections with consumers who cannot become self-sufficient, to integrating renewable generation where regional coordination is not sufficient, measuring and sharing of data, and facilitating the usage of open standards and protocols to connect energy solution. High voltage and medium voltage grids are the backbone of the grid and are controlled by a regulated DSO. Funding of the construction and maintenance of grids are no longer covered by traditional transport tariffs. As more neighbourhoods are becoming energy neutral, support for socialisation of costs declines. Costs are therefore locally socialised based upon chosen solutions, with a remittance for the maintenance of the transmission grid.

6.3.4 Strategic position in Together independent

In a world where low voltage grids are handed out in concession to market parties, the DSO experiences competition where they traditionally occupied a monopolistic position. Whilst the distribution market is still regulated, new market parties have entered to compete on quality and price, within the constraints set out by national regulation. On non-regulated markets the DSO is active as central facilitator, giving them a vital role. Their environment is characterized by a high degree of competitive intensity, mostly due to the amount of technological turbulence following a high innovation curve. Environmental complexity rises due to the sheer amount of new services and service providers active on the energy market. Enexis' core resources and capabilities are characterized by a significant decrease in tangible assets, as low voltage grids are handed out in concession. The resulting strategic position can be shaped using current strategic goals: affordability, reliability, sustainability, and customer focused. When applying Treacy & Wiersema's model of value strategies, Enexis puts effort in all three value options. The focus is on product leadership in order to effectively procure concession based maintenance contracts and offer the best quality innovative energy advice.

6.3.5 Business model canvas: DSO as advisory company

In this world of self-sufficiency and many new service providers, the DSO still has an important role to play. They are still the backbone of the energy market in caring for the main energy transmission grid and the medium voltage distribution grids. Low voltage grids are handed out in concession, making the DSO a competitor in a competitive, but regulated market. The DSO also has a facilitating role on both consumer and business energy markets in providing (measuring) data and providing open standards and protocols. Their business model then knows many changes and alterations, as depicted in figure 6.3-1.

Key partners see a significant change in a world where the firm experiences competition on all its activities. Collaboration throughout the value chain offers a way to keep a sustained competitive advantage. Most (new) partners are specialised firms, offering new services based upon (open) data.

Key activities see the largest change in this scenario. Due to ‘losing’ the low voltage grids ownership, the maintenance and management of these grids has become a competitive activity. Therefore, new market activities are required to keep up and beat other competitors. On the transmission grid and medium voltage grids the DSOs still retains a monopolistic position within a regulated playing field. New activities of the DSO focus on connecting with the market and their customers.

The DSO knows a significant write-off in their tangible assets due to concession rights. Their new position on the competitive market puts an emphasis on the quality (and amount) of their technical skills and staff, and their corresponding intellectual capital.

The value proposition of the firm is still valid in a world where competition exists on their core activity. By aiming at affordability, sustainability, and reliability, whilst maintaining a customer focus, Enexis uses a differentiation strategy to gain a competitive advantage.

Their value proposition is then distributed to their customers using both current distribution channels and new, direct marketing channels in order to market their competitive advantage.

Customer relations need a strong focus in a market with competition. The firm needs to be (more) visible to its customers. A marketing department should position the firm as competitive firm in a competitive market.

In terms of cost structure, Enexis is forced to decrease its net driven investments. Their competitive position however makes that costs need to be allocated to marketing of their activities and value proposition. A new cost is introduced as the concession fee, paid yearly to the regional government(s) owning the grid.

The main revenue streams of the DSO change significantly. The socialised connection tariffs are gone for the low voltage grid. A connection fee is regulated in the concession rights for the region. Parties willing to fulfil the concession are bound by these regulations for their revenue.

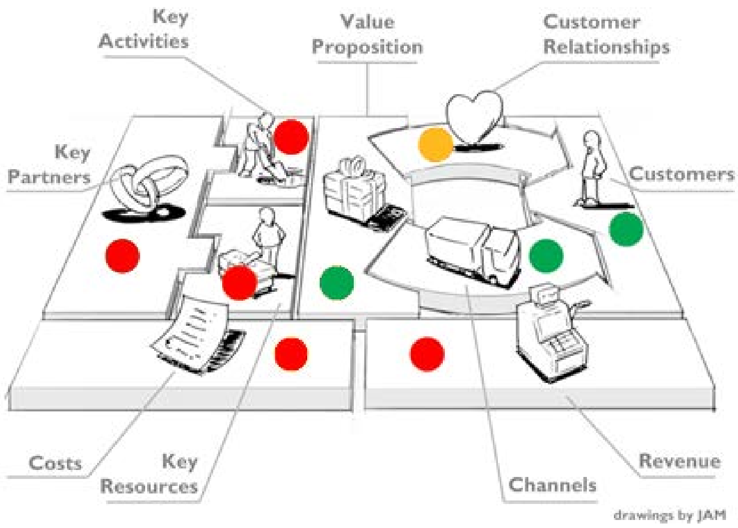

Figure 6.3-1: Business model canvas of the DSO in ‘Together independent’

6.4 Scenario #3: Everything arranged

It is 2030. Welcome in a world where people have trust in institutions and have no desire for self-sufficiency. The world knows few new energy services and energy service providers. As a reaction to geopolitical unrest and excesses of market forces in the energy, construction, and financial sectors, European countries have overcome their cultural differences and strengthened EU collaboration. This has renewed trust in large firms, institutions, and governments. Consumers have little need for large changes. The interests of traditional parties are served and entry barriers for new firms are high. Research & development is mainly focused on existing techniques. Energy is a low-interest product. Firms in the energy value chain choose robust solutions for new challenges like electrical transport and heat grids. Market regulation increases to make funding for these solutions available. Regional DSOs have been integrated into a single, national, DSO. Flexibility issues are best served by existing firms. The energy chain changes little.

6.4.1 The prelude: 2015 – 2019

Large challenges emerge for Europe in the prelude. Next to their economic power, India and China develop a strong global political influence. The OPEC experiences delivery issues resulting in strong oil price fluctuations. Immense refugee flows, the debt crisis of Greece and other southern EU member states ask the very best of EU politicians. The European Commission (EC) responds adequately, leading to reproaching EU countries and increasing trust of citizens in EU politics. Greece remains a member state, and England holds a public referendum whether to use the euro as payment instead of the pound, which passes with a large majority. Consumer trust increases also due to large firms and institutions taking corporate social responsibility and refrain from all bonuses.

EU member states accept a stronger EU political Union at a conference. The practicalities of this accord are energetically implemented. Europe is seen as a good advocate for the member states. EU countries support the notion of self-interest and that no company ought to be ‘too big to fail’. From a strong shared sense of urgency, Europe implements a strong industry, energy, and fiscal policy. Consumer protection is furthered. This leads to increased transparency on markets and the strengthening of institutions like the Authority Consumer and Market and the Central Statistics Agency. A steady development takes place for existing technologies for generation, storage, and management of energy. Existing parties have sufficient credit to sustain themselves; under EU pressure a further separation between network management and energy production / supply takes place throughout the EU.

Existing industries, like energy, construction, and car industry, profit from a strong EU. This strengthens support for supranational organisations like the NATO and World Bank to offer solutions on EU level against geopolitical unrest outside the EU by Russia and Islamic State (IS). An open EU market is facilitated to remain competitive with Chinese and Indian markets. In a number of international treaties the G8 negotiated to “agree to disagree”. Access to resources is certain for most countries. Within the EU serious agreements are made to reduce carbon emissions. Most member states form policy to make the use of locally available (waste) heat obligatory. In the Netherlands this results in the heat act by Kamp.

6.4.2 The interlude: 2020 – 2029

The period 2020-2029 is characterised by relative geopolitical stability. With a united and strong Europe, global politics are relatively calm. This creates peace on internal markets. Social partners collaborate to create new solutions to new challenges. To serve public interest, all Dutch DSOs are integrated into one single national DSO. This DSO manages both the transmission grid and regional distribution grids. Developments in information and communication technologies enable large scale energy storage and local energy management systems. Electrical transport thrives on new innovations and government stimuli. A centrally constructed loading infrastructure enables a society-wide adoption of electrical vehicles. The national energy system is renewed by all firms in the value chain to accommodate all changes.

Although society support for the use of natural gas and oil declines, the gas network remains in use due to public costs associated with it. For new construction projects gas remains an alternative, when local (waste) heat is not possible. Heat grids, a regulated activity, are constructed via a national program by the DSO. This infrastructural challenge creates immense opportunities in the construction sector, leading to an increase in employment rates. Standardisation enables efficient solutions and a fair distribution of costs. A competitive battle for good professionals is fuelled due to the simultaneous endeavour to make all houses energy neutral. At the end of the third decade the energy system is future proof. Energy suppliers implement a strong sustainable energy policy as a reaction to EU goals for reducing carbon emissions. With security of supply and affordability as key values, they ensure availability of renewable energy in the form of electricity, gas, and heat where needed. On a small scale new products and services emerge on the energy market. These are mostly marketed by existing firms who have a trust basis with consumers.

6.4.3 The finale: The world in 2030

The world in ‘Everything organised’ is a world where people trust institutions for the security of their energy supply. Few new services and service providers have emerged. Energy remains a low-interest product for consumers. Government and market parties have made many improvements to ensure an affordable, reliable, and sustainable energy system. Automation and the use of data led to better processes and services. Firms have not damaged consumer trust. People who believe in self-sufficiency are still idealists. The Energy Union is completed due to strong European collaboration. Europe knows a strong internal energy market, in which national grids are interconnected and energy prices are centrally dictated. The Dutch gas transmission grid is used as Gas intersection for the entire Union. The national DSO is ensured by this usage to recoup their investments in making the existing grids ‘smart’ and the construction of local heat grids. Measuring services and measuring companies play an important role in the market. Energy production and supply companies have focussed on new energy carriers like heat, large-scale biogas production and large-scale wind / solar parks. Gas remains a solid alternative for heat demand.

There is little room for new service providers due to strong regulation and low interest from consumers. Collaborations between firms remain at the same level as 2015 due to no real new competition. Existing firms collaborate in order to create economies of scale and collaborative R&D. Both energy companies and housing associations offer large amounts of solar energy on their houses. These are profitable due to the large scale and long depreciation periods, and in the case of rental housing, due to the low energy bills. Subsidies for energy efficiency are no longer needed. Companies in the energy value chain are increasingly becoming active in daily life of their customers. Large scale production is more visible for consumers and smart grids enable an efficient usage pattern of energy. Energy demand management via IT systems requires trust from consumers, which they are willing to provide. Municipalities play an important role in securing public trust and form an intermediary between large institutions and consumers.

The industrial market has developed steadily. The EU climate for existing industries has remained profitable. Industry energy usage has decreased due to efficiency improvements, in part due to government regulation on carbon emission, in part to an increased social corporate responsibility. Companies collaborate with their energy suppliers to apply strong criteria for their energy supply demands. EU carbon reduction goals for 2050 are on schedule.

Changes in the mobility sector are still going strong. EU norms for maximal carbon emission for vehicles are stronger and stronger, making every new generation of cars cleaner. The 2 million electrical cars boundary is achieved in the Netherlands. Electrical cars have become affordable due to the adoption rate; even more affordable than traditional fossil fuel cars. Continuous battery improvements and the wide availability of loading points make that most complaints against electrical vehicles are negligible.

The increase in electrical transportation results in an equally large increase in energy usage. In combination with large scale sustainable energy production this leads to congestion on the grid. The DSO solves this with congestion management, reinforcing grids, and strategically placing storage facilities. Storage capacity of electrical vehicles is also used as smart solution. The goals laid out in the Energy Accord are met with ease.

Aging of the population poses issues for the DSO to retain required personnel and competences. Innovation is a core quality within business processes. Smart new ways of working leads to the revaluation of fixed employment.

6.4.4 Strategic position in Everything arranged

The national DSO is monopolist on all transmission and distribution tasks, therefore experiences no competition on core activities. Overall the firm has no real ‘need’ for a strategic position on their core business, but as the firm also operates on commercial markets, the business units engaged in these commercial activities do strive towards a value strategy. On adjacent activities like measuring and metering services the firm collaborates with market parties in order to create a business case for data services. The environment is characterized by a very low degree of competitive intensity. Technological turbulence is also low, following an evolutionary innovation curve. Environmental complexity is rather low due to the homogeneous activities of the regulated national DSO. The national DSO’s core resources and capabilities are an extension of current resources and capabilities of all DSOs combined. In this they are not altered, just scaled. The market which they operate has not changed, making the national DSO a continuation of current DSOs. In this the new national DSO strives towards operational excellence in order to get economies of scale for the national grid, product leadership in order to cut costs and improve quality, and in part customer intimacy as the firm is even more visible than ever.

6.4.5 Business model canvas: national DSO as directing company

In this world of trust in institutions and few new service providers, the national DSO is the backbone of the energy market in caring for the total energy supply. Their business model then knows no real changes and alterations, as depicted in figure 6.4-1.

As monopolist national DSO the key partners do not change much. In essence the company is a larger scale of the previous DSO companies, with the same government mandate. They still have partnerships with contractors, educational institutions, energy suppliers, IT suppliers, etc. to engage in their activities.

The national DSO still has the same key activities: maintaining the energy grid, reducing net loss, market facilitation and risk based asset management.

Their resources are the entire national energy grid. The categories of resources are the same, but the scale of them is multitudes higher.

The value proposition of the national DSO will likely be somewhat similar as Enexis’ current value proposition, as government regulation focusses on an affordable, stable energy supply.

Distribution channels have stayed relatively the same; the national DSO fulfils the same activities and has the same issues with their consumers. In order to best serve their consumers, they ought to increase the amount of direct contact with their customers.

Customer relations are also for a monopolist of high importance. As national DSO, the distance between them and end users is somewhat larger than a regional DSO has, making the relations that much more important. Personal services are required to sufficiently reach their customers. Customer segments will likely not increase much; although the distribution per group may shift.

In terms of cost structure, the national DSO has the same costs as a regional DSO, albeit on a larger scale. Integration costs are added for the large-scale integration into the national DSO, which could affect the external focus of the firm and the amount of trust from stakeholders (Molenaar, 2015).

The main revenue streams then are also the same. A basis for socialised costs still exists, elevating the need for a different revenue structure.

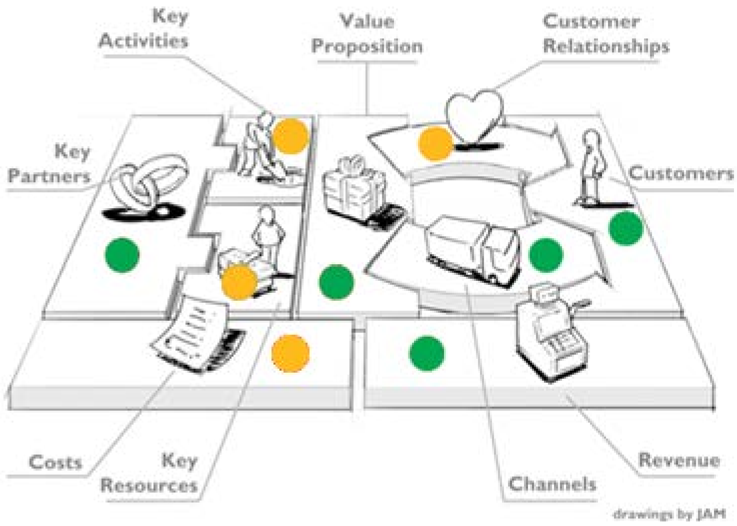

Figure 6.4-1: Business model canvas of the DSO in 'Everything organised'

6.5 Scenario #4: Do-it-yourself

It is 2030. Welcome in a world where citizens choose to be self-sufficient and rely on proved solutions and own initiative. The world has been instable for a decade. The collapse of the European Union has decreased citizen trust in governments and traditional institutions. At the same time an increased awareness of the value of resources emerges. Consumers and companies are searching for a way to become independent from global politics and resource scarcity. They choose solutions where they stay in control. They want understandable solutions close to home. The trading economy flourishes. Communities emerge (sometimes online) in which open source solutions are shared. Consumers and small businesses go off-grid. They produce and store their own energy, which they also use for their mobility. Traditional energy producing firms almost exclusively operate on the industrial market. There is a low support or need for a central, regulated energy grid. Energy grids are reduced to a backup facility. The existing gas network will no longer be automatically replaced at the end of life.

6.5.1 The prelude: 2015 – 2019

Global developments have large impact on consumer and small company's trust in governments, international institutions and multinationals. Europe feels threatened from multiple directions.

Attempts by IS to expand their Caliphate stretch further and further and begin to touch western countries. Russia – EU relations remain negative and result in several border incidents. Governments, both EU and national, refrain from response and distance from each other. Distrust in institutions reaches a new depth after the financial crisis and after several scandals at housing corporations. Consumers are fed up with paying for the failed prestige projects of a small group of people who enriches exorbitantly every time. After yet another parliamentary inquiry in which the truth is seemingly kept from the public, national election turnout will drop below 30% at the end of the second decade.

Negative effects of gas production in the Netherlands keep lingering, making citizens more critical towards the finiteness of fossil fuels and other raw materials. It is more and more apparent that the increasing computerisation has a down side. Multiple privacy related incidents at large companies occur in which private data of consumers and companies become public. A large scale identity theft results in a large looting of bank accounts. Citizens and small firms desire to keep control over their identity and unite in communities seeking self-sufficiency.

6.5.2 The interlude: 2020 – 2029

A strive for self-sufficiency develops as a result of the tensions in the second decade. Consumers desire independence from large firms and the government. Geopolitical developments and European disagreement over actions lead to protectionist measures of multiple EU countries, increasing international market barriers. Citizens lose trust in free market economics and the indecisive government and feel the need to be independent of third parties for their access to primary needs like energy. As a response they turn to their direct environment, resulting in a stronger social cohesion within the neighbourhoods and local (sport) associations. The main thought there is “if they won’t solve it for us, we’ll do it ourselves”. Local sharing concepts and open source solutions develop fast. Innovation is primarily focused on concrete problems consumers and small firms experience in their quest for independence. Small scale, easy to install solutions for energy storage like home batteries and heat buffers develop and spread fast. New generation solar panels are developed in a high pace. Consumers replace their fuel driven cars with electrical vehicles for their transportation using energy produced by themselves. Oftentimes neighbours share their cars, decreasing the total amount of vehicles in the Netherlands. People are more locally focussed in both private and work life. The electrical bicycle becomes the primary transportation means.

SMEs are doing well. Entrepreneurs with a regional focus manage to keep consumer trust. Large firms show different strategies to remain competitive. Resource-intensive companies draw closer to the source in order to secure their supply. They adopt circular resource models out of economic necessity. Companies manufacturing consumer goods draw closer to their market and decrease in size in order to strengthen regional bonding with their customers. Customers are increasingly becoming involved in innovation; co-creation and crowdfunding increase in popularity.

The discussions on the socialization model for network management costs are becoming stronger. The growing group of self-sufficient customers are no longer willing to pay for the central energy grid, as they already pay for their own solutions. The average customer only needs a back-up function minimal rate. Government regulation and DSOs have no other reply than slowly reducing the energy grid. A real solution arises well after 2030.

6.5.3 The finale: The world in 2030

The world in ‘Do-it-yourself’ is a troubled world where people move away from large institutions and where politics and large firms enjoy little trust. The world poses large challenges for the DSO. Societal changes have a large influence on the energy landscape. A significant share of consumers is self-sufficient on the field of energy, using their own local production and storage facilities. A limited form of regulation exists from the Dutch government. Europe takes no part in the energy supply. Due to the significant resolving power and the free sharing of knowledge using online platforms, a multitude of solutions has emerged, fitting local conditions. Large firms play a limited role; consumers still need products for their necessities, but they are not loyal to brands. Companies who manage to respond to local needs remain profitable. Transparency is of adamant importance for firms trying to remain competitive. Consumers want to know where products came from and how they were build. People are aware of the importance of resources and demand a circular approach of firms. They are willing to pay a premium for modular, repairable products with a reliable origin. Innovation is focused on resolving customer problems and is mostly at existing regional firms; there is little room for large commercial companies. Big data has been decimated due to privacy issues. Many neighbourhoods or streets have their own server with also their own energy management systems. Many services and products are managed on street / neighbourhood level, increasing local trust and forming intrinsic relationships with neighbours. Previously large issues like the multi-cultural society are reduced to large city issues, now people are reconnecting on a local level.

The energy mix is locally optimal. Local communities make use of waste heat or geothermal energy where available. People produce their own energy individually or in local cooperation's. In this, they also locally balance production and use, using local demand side management, storages and heat buffers. Consumers are massively closing their gas connections. They have a lot of interest for insulation and energy saving measures, because it brings them closer to self-sufficiency. In densely populated areas with lots of old buildings this is not always feasible.

Energy-intensive companies have invested in energy systems in which both gas and own renewable production (solar, wind) is combined to different levels of storage (both energy storage and buffers). These firms are energy efficient and have a contract with traditional energy suppliers for their possible shortages. Traditional energy suppliers have made their energy mix sustainable under pressure from high oil prices and protectionist measures by the national government. Both the energy grid and the gas network have important roles, but on more and more places the gas network is no longer automatically replaced after end of life.

Mobility is mostly electric. People are focused on their own region, reducing the amount of long distances travelled. The electrical bicycle is prominently visible. Longer distances are mainly taken with electrical vehicles. These cars are usually shared property with neighbours; people attach less value to property, more on availability. New forms of transport between bicycle, motor, and car develop. Loading facilities on the road become available via online communities, where consumers can 'rent out' their home facility for a price. Consumers always know a neighbour who can perform maintenance on their cars, home batteries and open source energy management systems; else they can easily find one via social media recommendations.

Reliability of energy supply is a primary focus for companies. Average reliability decreases due to the diversity of local solutions. Consumers are willing to settle for less reliability when it enables independence. The DSO's role changes significant as the central distribution grid is less and less used. There is little support for a robust network with socialised costs. Regulation aims to keep the central basic energy grid intact for industries and as a backup for consumers and SMEs. The government mainly regulates for the purpose of safety. The main role for the DSO is maintaining the existing energy grid. Energy Network Management and market facilitation are increasingly complex due to the multitude of local systems. Who should fund the dismantling of the central grid and what should remain is still point of discussion. DSOs are still searching for their new role, and tap new sources of revenue via the support of local collaborations. The central energy grid is funded using the property taxes instead of the transmission tariffs. Strategic networks or alliances have a timed nature; they are initiated by consumers and groups of consumers / small firms in order to acquire products or services, but these collaborations are disbanded as soon as all targets are met.

6.5.4 Strategic position in Do-it-yourself

In a world without support for socialization of costs or for a central energy supply system, the DSO is threatened by obsolescence on the consumer market. They do however still fulfil their traditional function for the industrial market, and in part as a backup for consumer markets. As a new activity the DSO tries to support local initiatives and energy cooperation's in solving their local energy systems using local sources. On their core regulated activity the DSO remains a monopolist, but on other, non-regulated markets the firm has to compete for customers. In terms of environmental factors, Enexis experiences low competitive intensity on advisory activities, and no competition on grid operations. Technological turbulence is low due to lower innovation rates. The environment is however characterized by increased complexity, now the majority of people desire self-sufficiency and choose local solutions. Their resources and capabilities alter significantly, now low voltage grids have become a backup utility. Technological resources will decrease, whilst intellectual resources need to increase in order to remain profitable. In this altered landscape Enexis needs to focus on customer intimacy value strategy in order to retain a customer basis and keep a market role. Product leadership and operational excellence are also required in order to survive, but do not require the same effort as customer intimacy in this scenario.

6.5.5 Business model canvas: DSO as back-up regulator

The DSO still has key partners, which assist in the construction / dismantling of energy grids, help with pilots for local solutions, or network management. The DSO also actively seeks collaborations with local energy cooperation's and small groups of consumers in order to locally optimize the energy supply. Their business model then knows many changes and alterations, as depicted in figure 6.5-1.

Key activities of the DSO include maintaining a backup-function for the low voltage grids, whilst strengthening the medium voltage grids for industrial customers. They are also active in offering energy advice to partners and consumers.

With their key resources a shift can be identified from tangible assets to intellectual assets; the low grid is less and less used, whilst intellectual resources are better usable for advisory activities. Significant cutbacks are required on the low voltage grids.

The value proposition of the DSO will shift significantly. The DSOs primary proposition will be the offering of a low-cost backup utility for consumers, whilst offering reliability for SMEs and large companies.

The distribution channels of the DSO will likely not change much; although a more direct approach would likely be better when consumers have little faith in institutions.

Customer relations then are a subject of great importance for the DSO. As an institution, personal contact and customer relations make that the firm can hopefully survive on advisory activities.

The cost structure in this world is dominated by significant write-offs on the tangible assets, as the low voltage grids are less and less used, but need to be maintained, and the gas network, whilst not being significantly used, still has a large depreciation.

As there is virtually no support for socialisation of costs, the revenue of the DSO is very uncertain. The income via property taxes meant a sharp decline in revenue, as this revenue, although regulated, is lower than traditional transport tariffs. Funding via property taxes decrease the revenue streams for the DSO, posing troubles for their business model.

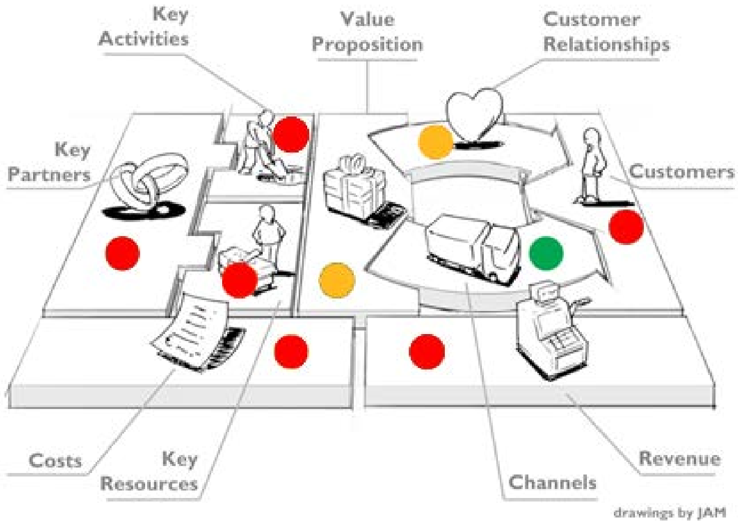

Figure 6.5-1: Business model canvas of the DSO in 'Do-it-yourself'

6.6 Overall scenario implications

Concerning the last sub question "What implications do the scenarios show in terms of strategic future for Enexis", some implications are found in multiple scenarios. Both the worlds 'Coupled supply' and 'Everything organised' know a role for the DSO as continuation of current activities. The worlds 'Together independent' and 'Do-it-yourself' see a new role or activity as advisor for the DSO. In the worlds 'Coupled supply' and 'Together independent' the DSO is focused on facilitating other market parties, in part by releasing (measuring) data and access to IT systems. When comparing business models of the DSO in 2030, some parts of the BM canvas show a high susceptibility to change in all four scenarios, as depicted in figure 6.6-1. In the future, Enexis' business model is likely threatened on their key activities, key resources, their cost structure, revenue streams, and customer relations. In most scenarios the activities and resources are threatened by changing ownerships over the energy grids and corresponding maintenance / management activities being handed to the market. The revenue streams are subject to change due to lower support for cost socialization and (new) grid ownership changes.

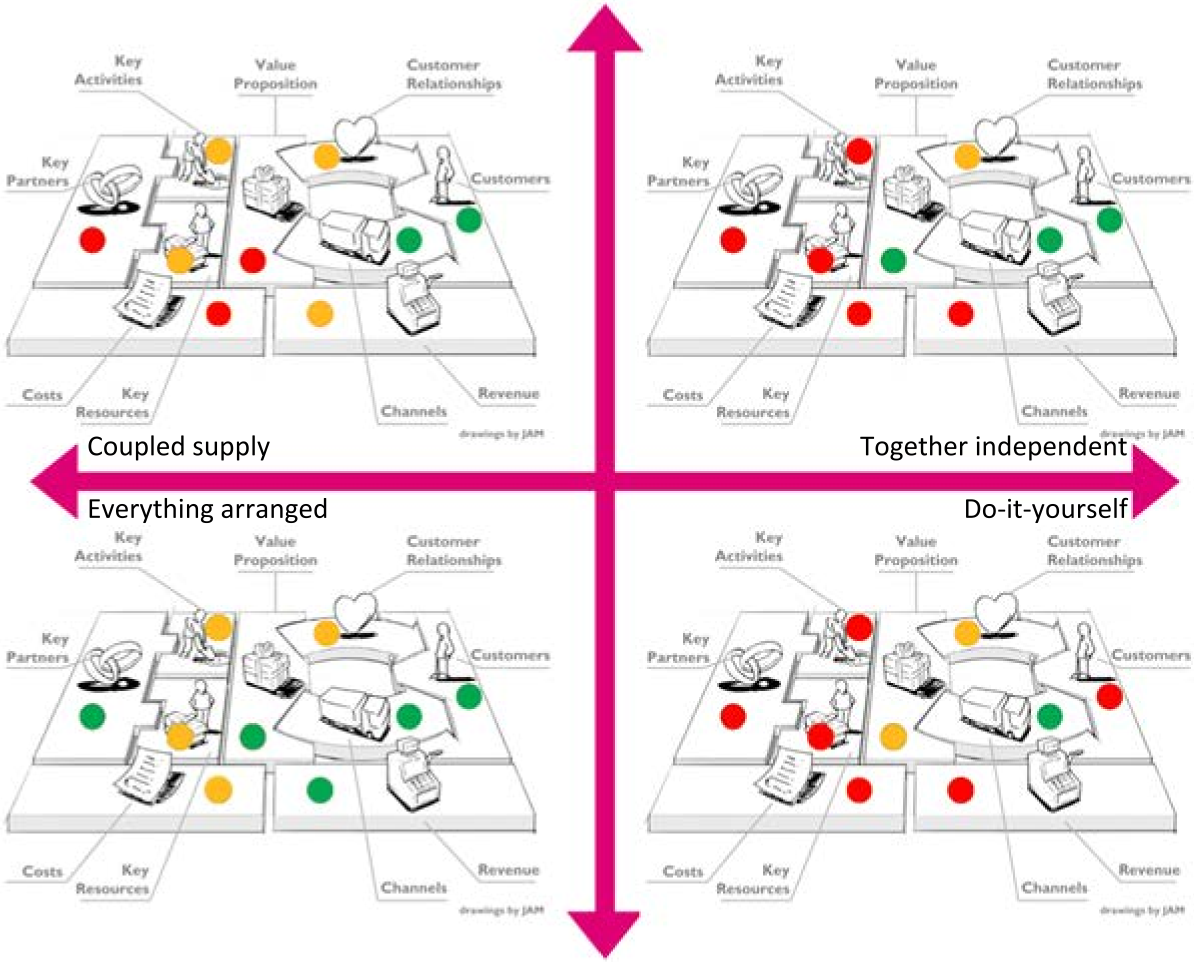

Figure 6.6-1: Scenario business model comparison

Each scenario world shows a different role for the DSO Enexis; and in this also shows a different strategic position. When zooming in on the strategic position of Enexis within each world using the conceptual model by Kim et al., more overlap can be seen, as depicted in table 6.6-2. Three out of four scenarios show significant threats to the strategic position in terms of new entrants, substitute products, and bargaining power of buyers. Environmental complexity also rises significantly due to either new services and service providers, or due to increasingly demanding citizens.

	Coupled supply	Together independent	Everything arranged	Do-it-yourself
Kim et al. Environmental factors (expanded with 5 forces framework)				
Competitive intensity	Many new competitors on advisory / new grid construction	Many new competitors grid concessions / advisory	No competitors	Competitors on advise, no competitors on grid functions
Threat of new entrants	High	High	None	Low
Threat of substitute products	High	High	Low	High
Bargaining power of suppliers	Low	Low	Low	Low
Bargaining power of buyers	High	Very High	Low	Very High
Technological turbulence	High turbulence	High turbulence	Low turbulence	Low turbulence
Complexity	High complexity	High complexity	Low complexity	High complexity
Kim et al. Resources / capabilities				
Communication effectiveness	High effectiveness for effective collaborations	High effectiveness to fulfil advisory activities	Low effectiveness required for monopolistic tasks	High effectiveness to fulfil advisory activities
Intellectual resources	Increase in resources (staff)	Increase in resources (staff)	No real changes (only size due to integration)	Increase in resources (staff)
Technological resources	Increasing due to large-scale energy infrastructure needs (storage etc.).	Decreasing due to concession rights	Increasing due to centralized energy system	Decreasing due to low usage
Strategic position	Focus on product leadership / operational excellence	Focus on product leadership	Focus on Operational excellence	Strong focus on customer intimacy

Table 6.6-2: Overview table of scenario comparisons, structured by Kim et al. (2002) conceptual framework


ENEXIS

7 Conclusions

Chapter VII – Conclusions

This research has followed the linear path laid out by the scenario methodology by Schwartz. During this time we deduced 909 trends into 29 trend categories, which produced 9 scenario issues, out of which the 2 most uncertain issues have been selected to form 2 scenario axes. Based upon these 2 axes a total of 4 scenario narratives are constructed to view possible futures as depicted in figure 7.0-1. During this process the sub questions of this research have been answered, leading to the main conclusion in this chapter, followed by my general recommendations to Enexis and a discussion on the strengths and weaknesses of this research.

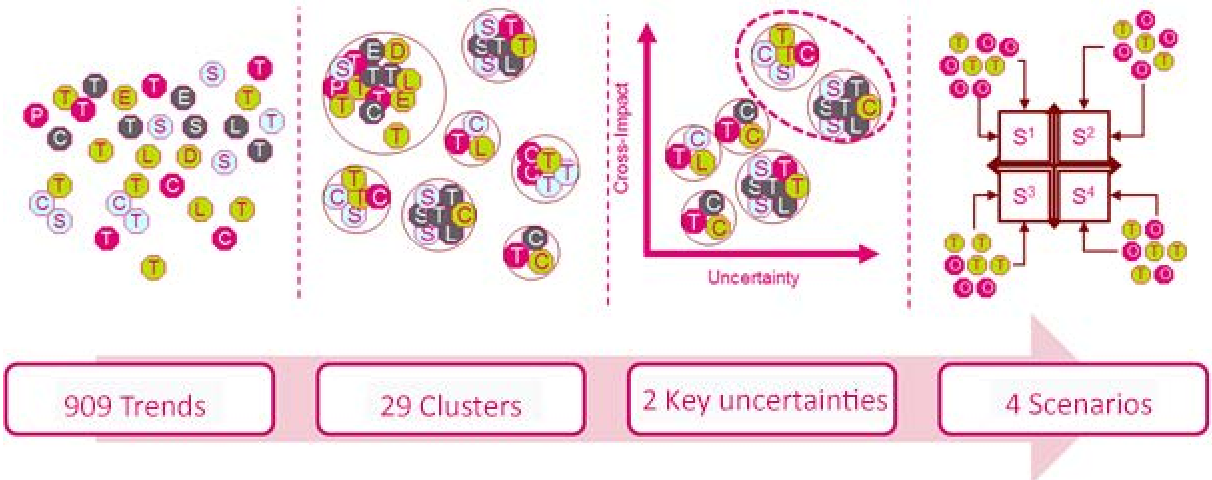

Figure 7.0-1: Research path

7.1 Conclusion

The four constructed scenario worlds each show a distinctly different future role for the DSO. Overlaps are seen on the need for a customer intimacy value strategy, but the practical implications of that need differ for each scenario. In the 'Coupled Supply' world, the DSO still maintains the current energy grid, but new grids fall out of their business scope. The firm engages in a secondary advisory role in the construction of these new grids, but they are market owned and maintained. The focus is mostly on operational excellence and product leadership value strategies. In the 'Together Independent' world this separation of ownership goes even further, by handing out all energy grids in concession to those market parties who win the concession. This opens up the distribution market to competition, which makes having a strategic position adamant for survival. Customer intimacy is a prominent value strategy which needs most attention. Product leadership is used to connect with firms throughout the value chain in order to provide a competitive advantage. In the scenario world 'Everything Arranged' the strategic position does not alter much from the current position; it is scaled upwards due to the merger of all DSOs into one national DSO. The challenge here lies in (1) the integration into one national DSO itself, and (2) the connection to a European energy grid and all transmission and distribution challenges associated with it. Focus point remains on operational excellence, with little 'need' for customer intimacy or product leadership value strategies. The scenario world 'Do-it-yourself' finally knows a strategic position threatened by obsolescence for the DSO, as the majority of customers are going off-grid or otherwise supplying their own energy. The social basis for socialised tariffs is gone, threatening the core business model. The DSO focusses on the industrial market and providing backup energy grids for consumers who cannot (or will not) go off-grid, but the exact role of the firm is still in peril in 2030. In this the firm needs to pursue a strong customer intimacy value strategy, together with a large effort in product leadership in order to stay in the market.

In each world however, the firm requires high-quality relations based on trust with other firms throughout the value chain. The relations are mostly based on non-traditional contractual partnerships or voluntary agreements rather than equity arrangements, building upon both trust and economies of scale and scope. These strategic alliances are apparent in each scenario , making them of importance for Enexis and a key focus point.

For most scenarios, the emergence of new services and new service providers creates challenges for the DSO. Whether the energy grids have been handed out in concession, or new grids owned by the contracting party, the DSO loses their monopolistic position and become a market oriented firm. Their core activities shift with this change towards a more advisory company. These changes also work on in their business model, which will likely shift towards this more service oriented business model, with multiple new revenue streams based upon their new advisory role and grid-related operations. The cost structure is likely to shift also, as multiple scenario worlds show a separation of ownership and maintenance of the grid.

The energy market knows different threats in each scenario, but in most scenarios at least both key activities and key resources are threatened, setting the current energy market on a radical destruction trajectory towards 2030. Everything is up in the air; a radical change in Enexis' business model is required to remain profitable in the future. The question …

"What are plausible strategic positions for Enexis in the energy market in 2030?"

… then cannot be answered by a single strategic position. Each constructed scenario is too far apart from each other to generate a baseline for the future. A choice has to be made on how to go forward, three options are available.

First, Enexis can monitor the world, and using half year or yearly surveys among a multitude of both experts and consumers follow developments and trends to see where the world is going. Using a monitoring system allows the firm to keep up with developments and make big or small investments towards the world we're seemingly heading towards, but the weakness of this system is that you can never walk ahead of the curve; effectively shutting down innovation. This can be a very safe strategy, waiting and monitoring, but when development pace increases, it can be very difficult to keep up with the pace; increasing the danger the firm falls short.

A second option can be to simply 'choose' the preferred world (based upon company goals or most beneficial situation for consumers) and backcast the required steps needed in order to reach that future world. When choosing this 'point on the horizon', the largest danger is that the point selected, is not the 'best' or most ideal world. Also, when making heavy investments into for example scenario #1 Coupled Supply, the danger can be that in 10 years' time the world developed in the direction of scenario #4 Do-it-yourself.

Third and finally, Enexis can combine both methods. By monitoring developments, whilst making big-bet investments towards a preferable world, and implementing small investments towards other developments, the firm can enable a quite safe strategic future position. As each scenario world requires some significant changes to the business model, the firm can already begin with implementing those changes that would increase the quality of their services. The drawback of this route is that the firm is knowingly investing in a world which may not come to light, 'wasting money'.

7.2 Recommendations

Based upon the roles set out in each scenario, Enexis' strategic position is of a high-quality energy system operator on every scale, whether national, regional or local. The current strategy then follows a quite similar path, focusing on affordability, reliability, sustainability, and customer focus. They can keep up the current strategy set on operational excellence and product leadership, although the customer intimacy value strategy should receive more attention. Based upon my findings, I have six recommendations in order to strengthen their strategic position. Enexis should monitor the world and assess its direction. Next to monitoring, the firm ought to decide to be an initiator on the energy market and clear the way for a sustainable future. Enexis needs to create company strategy and corresponding policy on the following fields:

1. Energy is a primary life need for Dutch consumers, which most consumers also take for granted. In some scenario's energy becomes a more visible / high interest service, making high quality relationships and collaborations with market parties of paramount importance for the DSO. Enexis needs to improve their customer relations over the next 15 years, opening up and engaging consumers and (small) firms in optimizing their energy demands on whichever scale is required.
2. The energy grid itself is also subject to major change; a lobby should be opened with both European and national governments to enable market mechanics on the distribution market and flex energy market policies. The government should actively engage the energy market with facilitating policy rather than regulating policy. Safety and security of supply should become focus points for governmental policy. Enexis should actively engage the government, other DSOs, and market parties in order to create a future ready energy system and reshape policy.
3. As consumers are increasingly generating their own energy, the DSO faces a decrease in support for socialized tariffs. In order to retain support, Enexis should become more visible and help people fulfil their energy demand through offering local, optimized energy advice.
4. Try to be as flexible as you can get concerning grid operations. Many uncertainties accompany the future of the energy grid; primarily the gas network is subject to a high degree of uncertainty over its survival. Research could be done to assess easier network dismantling, or even build in a phasing method, decreasing potential dismantling costs. Also, if gas networks are not required to last 40 or 50 years anymore, the choice can be made to use lower-grade pipes which have a life cycle of 25 – 30 years to reduce investment costs.
5. Open up the debate with car manufacturers and manufacturers of loading facilities concerning the future of a public loading 'grid' for electrical transportation. Electric vehicles are here to stay; the decision has to be made to invest in a loading infrastructure in order to meet future demand. In order to reduce consumer / investment costs and increase effectiveness / usability, standardized loading solutions are to be researched, regulated, and maintained in collaboration between the government, car manufacturers, loading facility providers, energy providers, and DSOs. The loading infrastructure can be coupled to the medium voltage grids and provide a smart storage facility together with strategically placed batteries in order to overcome any future intermittency issues, making the DSO an important initiator of change.
6. Large-scale solar and wind generation plants are the future. Local energy will not become significant within 15 years as consumers like to be taken care of. Enexis can assist energy producers by sharing usage and distribution data in order to search for optimal placement of large scale renewable energy stations, just as energy producers can share their insights in optimal locations for large-scale generation in order to assist DSOs in deciding where to invest in the grid. A strong collaboration between producers and DSOs can enable a better quality, future-proof energy infrastructure.
7. In correspondence with the previous two points, it is identified that strategic alliances are of importance to the business model of Enexis. The firm therefore should actively seek out and collaborate with (new) firms throughout the value chain in order to increase performance and

quality of services for both firms. Enexis is an energy market facilitator; therefore actively facilitating existing and new firms to improve their services will assist in increasing the overall quality of the energy network.

Enexis then has a somewhat future-proof value strategy for the coming years, but large changes to the grid are coming. The gas network seems to have run its course in 2030, in part replaces by heat networks, in part by all-electric neighbourhoods, and in part due to new energy carriers like biomass and geothermal energy. The logical conclusion is to not automatically replace the gas network at end of life, but rather begin investing in other, more sustainable solutions in those areas. In general, Enexis should be a facilitator of the energy system. In collaboration with other DSOs they should enable a future energy system, in which energy carriers are integrated and optimized on a local level, reducing congestion and increasing reliability and affordability. The DSO should become the 'place to be' in 15 years when it comes to energy infrastructural questions on every scale.

7.3 Discussion

The scenario analysis methodology then can be used in multiple fashions. You can roughly divide scenario analysis methods between forecasting, backcasting, and as a foresight tool. When forecasting, you select a starting point and 'follow' the future to a certain point you want to reach, in a sense predicting the future. Backcasting second, entails selecting a point in the future, and backtracking steps required to reach that point. In this thesis, scenario analysis is rather used as a foresight tool; we assess which futures are possible, but do not select a 'favourite' scenario. The goal of this method (and thesis) is to initiate the debate on long term strategic planning for primarily the DSO, but also other stakeholders engaged in the energy market. The explorative nature of this research enables a strategic insight from past and present trends towards the future.

This research followed a specific structure, beginning with the internal company in the present, followed by an environmental analysis, finalizing with the company in the future environment. The production of four scenarios is structured by the scenario analysis method set out by Peter Schwartz in order to increase the power of the scenarios. Given the amount of trends collected, and the sample sizes used during the process (cross-impact matrix, expert survey) the process of selecting two key uncertainties for axes is rather reliable. Although all experts in this phase are internal staff members of Enexis, each person is an expert on their field, representing the entire company and all departments. External experts were considered but not used in this phase due to time constraints. The selection of scenario axes, and with it the formulation of scenarios, has been completely done in-house and could therefore suffer from a bias due to a more similar perspective of all respondents; a follow-up study could therefore begin with the same provided trends and strategic questions and repeat the analysis method.

As this research uses both qualitative and quantitative results, validity is discussed using the typology of Shadish et al. (2002). The internal validity of the research describes the causal connections made in the research, i.e. is there substantial evidence generated to support the conclusions (Shadish, et al., 2002). This research uses the structure provided by Schwartz in order to facilitate the causal connection from individual trend to scenario narratives, increasing internal validity. External validity describes the generalizability of the research (Shadish, et al., 2002). External validity is high due to the amount of trends identified on the energy market. If another DSO will reproduce this research method, chances are high that the same trends and trend clusters will be formed. The selection of scenario axes however is likely specific for the used group of experts; and may differ when using another group of experts. The selection of scenario axes is based upon the connection with the main research question; for another question other axes may be more relevant. Construct validity describes the relation between used concepts and corresponding indicators (Shadish, et al., 2002).

Concepts are operationalized using the theoretical framework provided in chapter two, which is used throughout the study in order to create a n internal valid and coherent structure. I perceive construct validity to be high. Statistical conclusion validity describes the correctness of found conclusions based on the data sets used (Shadish, et al., 2002). This is provided by the sheer amount of trends found by the entire project team in multiple data sources, among others the opinions of 20 experts. Experts are selected based upon perceived interest and knowledge of both the energy market and future developments. The final result then is based upon a qualitative approach, in which Delphi methods where used to create consensus between all project team members concerning trend clusters, their relative importance, and the selection of the two key uncertainties to be used as scenario axes.

The combined effort of all project team members then have fed the results presented in this thesis. The generation of the trend list of over 900 trends has been done by all members, whilst the clustering and further on selection of key uncertainties has been done by the core team members. The scenario narratives are also the result of the combined effort of all team members, where the core members have the larger effort. I myself have been actively engaged in all stages of the process, from planning and having interviews with external experts, to trend identification, clustering, selection of uncertainties and finally writing the scenarios. Often times my work entailed creating the first draft versions after which the project team elaborated on them with specific knowledge from their expertise and join my supervisor / the project leader in the final redaction of each piece. My conclusions are based upon this combined effort and corresponding results.

This thesis then describes the process of forming four distinct future societies with a focus on the energy market, concluding with six recommendations to the DSO to increase their strategic position in 2030. The external validity of this research is warranted by the combined effort of all project team members and external experts involved. Companies engaged in the energy sector or desiring to expand to the energy market can use the constructed scenarios to test their own strategies and assess their chances on success in the future.

Enexis can undertake follow-up studies on the recommended focus areas provided; the future of the gas grid and the incorporation of a loading infrastructure pose enough challenges to justify significant research and collaborations in order to prepare for the future.

On practical relevance, this thesis combines the use of scenario analysis with strategic positioning business model theory, and the industry change model in order to assess the direction of an entire market towards the future. This combination of theories appends to strategy theory in general due to the combination and usage within scenario analysis. This makes it possible for similar firms within this market to assess their current strategy and benchmark it against possible futures using a clear framework.

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