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CERTIFICATIONS AND REGULATORY VERIFICATIONS NEED IN LNG TERMINAL OPERATIONS

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ABSTRACT

Energy markets have been changing rapidly in the past years. Environmental issues are guiding the industry towards more sustainable and responsible energy production methods. Tightened CO² legislation and the high cost of fossil fuels are directing the industry towards renewable energy forms and bio based energy sources. Energy industry is highly regulated by the authorities' requirements and mandatory verifications. To improve energy industry's performance also non-mandatory certifications exist.

The aim of this thesis was to study the business environment of a LNG terminal operator, Hamina LNG Ltd. The objective was to present what voluntary certifications and regulatory verifications the development of the LNG terminal business requires. The subject was studied through the perspective of customers and the authorities. With the knowledge of the certificate and regulative requirements, the company could anticipate the changes inside the energy industry and gain competitive advantage over other operators.

This thesis was conducted by using qualitative research methods. Primary data was collected via semi structured interviews and pre-defined themes. Secondary data was collected from existing sources to confirm the findings with the primary data.

The study showed that while energy markets are highly regulated the companies have pressure from the customers and competitors so the industry also develops new solutions internally. The mandatory regulations are changing due to the security of supply and national safety concerns. The non-mandatory certifications are used to verify the responsible and sustainable actions of the companies. The green step towards bio fuels creates requirements to ensure the origin of energy sources. As a result this also obligates the LNG producers to certificate Bio LNG according to the national laws.

Keywords: LNG, gas markets, energy industry, certifications, regulations

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1 INTRODUCTION

In this thesis the business environment of a starting LNG terminal operator is mapped and analyzed. The main goal in this study is to present what certifications and regulatory verifications the development of the LNG terminal business requires, both in terms of customer expectations and the requirements of the authorities. The aim of this study is to give Hamina LNG Ltd. some guidelines that can help the company to anticipate changes in the operating environment of the industry and how to gain a competitive advantage in the market by finding the right certification products compared to the competitors.

1.1 Background and the case company

The case company in this thesis is Hamina LNG Ltd. The company is owned by Haminan Energia Ltd. (46.5 %), Alexela Ltd. (46.5 %) and Wärtsilä Ltd. (7 %). The company is currently building an LNG terminal in the Port of Hamina in Finland. The 30 000 m³ gas storage is about to be opened to LNG business in the Q3 of 2022. In the beginning the capacity of the terminal is 6 TWh/year. Hamina LNG Terminal does not own or sell the LNG, but it offers storing, vaporizing, and fueling services (sea traffic vessels) to their customers. LNG can also be distributed from the terminal to the customers with trucks. The role of the terminal is significant while it improves the Finland's security of supply in energy sector. (Hamina LNG 2022.)

Hamina LNG terminal is connected to the national gas network in Finland and the local gas network in Hamina. There are two other LNG terminal operators in Finland but neither of those can produce natural gas to the national network. This makes Hamina LNG terminal unique when it starts operating in late 2022. The terminal has open infrastructure for all LNG and natural gas operators in the markets. It is also built to serve future energy needs with new solutions like biogases and P2X (synthetic energy sources). (Hamina LNG 2022.)

The topic for this thesis was selected while the commissioning company wants to know with what conditions it is possible to start the LNG terminal business. They

also want to know how to develop their business to gain a solid position in the LNG terminal business. The companies that are operating in the international markets can have advantage by following the standards in their business field. Operating the business by the standards, the companies can have easier access to the markets in the domestic and international business areas. Therefore the subject is important and topical to the commissioning company.

1.2 Development settings

The aim of this study is to describe the requirements and needs for various certifications or other verifications of Hamina LNG Ltd.'s LNG terminal's stakeholders (customers and authorities). The study examines what type of certifications it is justified to obtain from the business's point of view and whether they can be used to gain a competitive advantage over other companies in the industry. In addition, how to ensure the company's operating conditions in a changing operating environment is examined by studying the requirements of the authorities.

The objective in this thesis is to find solutions how the company can gain new customers and competitive edge compared to rivals in the same business field. To find out the customer perspective, the work is carried out by interviewing authorities, customers and energy experts. The interviews examine the customers' expectations, needs and requirements for the services provided by Hamina LNG Ltd. When studying the existing competitive situation in the markets, Hamina LNG Ltd.'s closest competitors will be determined and the benefits of the competitors and the certified products supporting their business will be benchmarked. The possible changes in the company's operating environment are studied from the perspective of the authorities. By interviewing the authorities, the goal is to find out the possibilities for receiving synthetic and bio-based gases at the terminal in the future.

To achieve the objective, the following research questions were formed. The main research question is:

1. What certifications and verifications are needed to operate the LNG terminal business?

The sub research questions are:

1. Can the LNG terminal business be operated without certifications?
2. Which certifications can provide competitive advantage compared to the rivals in the LNG terminal business?

1.3 Research methods

This thesis employs qualitative research methods. As the nature of this thesis is to compare the legal limitations, that are set by the authorities and the voluntary limitations arising from the markets' needs, and the voluntary limitations, that arise from the markets' needs, it is easier to collect and analyze the data with qualitative research methods.

The work is divided into two main parts: the customer and market perspective (voluntary certifications that can provide a competitive advantage) and the authorities' requirements for different verifications and laws. The primary data gathering is carried out by interviewing a pre-defined group of customers, experts and authorities. Secondary data is added to improve the reliability of the study.

1.4 Framework and the limitations of the study

In this thesis the Hamina LNG terminal business' theoretical framework is studied. The goal is to understand the most significant standards and certificates that are needed to operate LNG terminal business. The theoretical framework in this study consists of an overview of the standards that are required for businesses development (non-mandatory) and the authorities' regulatory requirements that are mandatory for operating the LNG terminal business. Figure 1 below illustrates how the theoretical framework is divided in this study into these two aspects. The theoretical framework can also be described as

understanding the external and internal business environment of the case company.

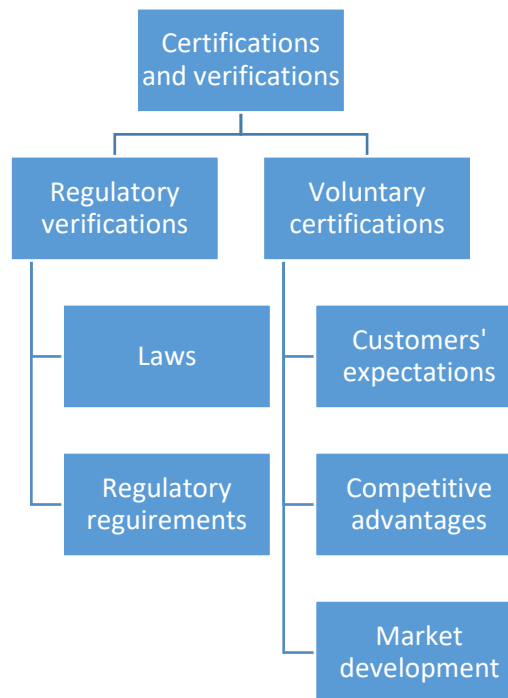


Figure 1. Framework of the study (Lampinen 2022)

This study is limited to contain the European LNG terminal business. Therefore, the limitations of this study are related to the amount of gathered data and the limited number of competitors that can be benchmarked. While the company's terminal business is still at the starting point of its journey in Finland, the potential new customers can also be difficult to describe at this stage. In the beginning, to understand the business environment of the case company, the following section concentrates on the theoretical background of business environment analysis. This helps to discover the priorities and tools that can be used to develop the case company's operations.

2 BUSINESS ENVIRONMENT ANALYSIS

The objective in this section is to represent the theoretical background of the study. The aim is to conduct a business environment analysis about the LNG terminal operations at the theoretical level. There are three core components in this theoretical study, external and internal business environment analysis and

SWOT analysis. The division is illustrated in Figure 2. External environment describes the forces that can affect the company's overall performance, profitability, and functionality. Internal Environment refers to all the forces that can affect the company's operations coming from the inside of the company such as company culture and employee onboarding. In the end, the external and internal components can be analyzed together by forming a SWOT-analysis of the business environment.

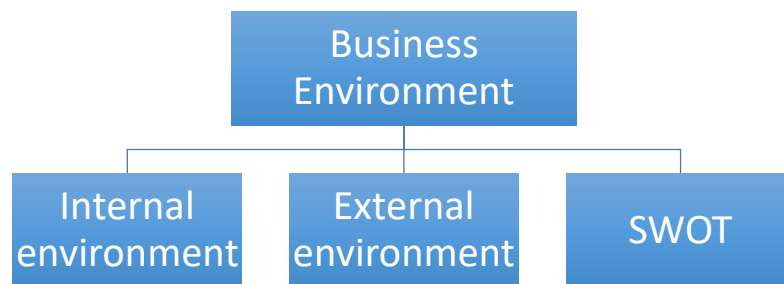


Figure 2. Business environment analysis (Lampinen 2022)

2.1 External environment analysis

External environment analysis helps the companies to examine the industry environment and make the right changes in the altering environment they operate. This includes factors of competition structure, the company's competitive position, future and historical development of the industry. External analysis also includes analyzing the macro-economic factors, global, political, social, demographic, and technological aspects. The main purpose of external environment analysis is to identify the opportunities and threats of the industry and help the companies to gain profitability, growth, and flexibility for their operations. (CFI 2022.)

2.1.1 PESTEL framework

When starting to analyze the LNG terminal operations business environment it

is important to identify the macro-environmental factors which can have an impact on the company and the business itself. A PESTEL analysis can be used to provide an overview about the business environment in its current situation. A PESTEL analysis can be seen as a framework or tool that will help the company to analyze the external marketing environment factors that can have an impact towards the company or the organization (Professional Academy 2022).

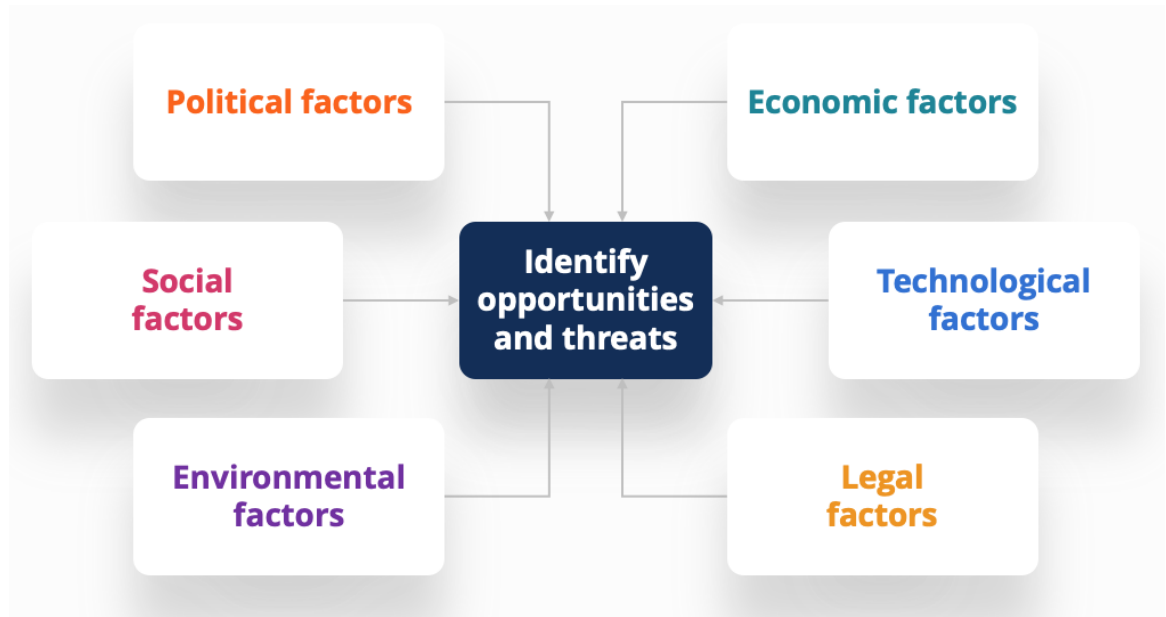


Figure 3. Pestel analysis framework (CFI 2022).

As seen in Figure 3 the PESTEL framework is a strategic tool, but it can also help to evaluate the companies to visualize the financial state of the current business environment in which a company operates. A PESTEL analysis takes into account the Political, Economic, Social, Technological, Environmental and Legal factors in the company's external business environment that it is operating in. (CFI 2022.) The following PESTEL factors are considered from general level of the Energy and LNG terminal operations.

Political factors

The main political factor that affects the energy sector's operations is highly regulated policies that the sector is obligated by. In Finland and the EU, energy markets are regulated by the government and laws, especially in electricity network and gas network markets. The Energy Authority (Energiavirasto) is the

supervising organization of Finnish electricity and natural gas markets. Energy Authority is also influencing that the national, regional and EU energy markets are developed towards sustainable manners and acts as the national supervising authority in Finnish energy wholesale markets. (Energy Authority 2022.)

While LNG terminal operators are obligated to regulations set and monitored by The Energy Authority, the tariffs also need to be approved by the authority. This sets a political risk to LNG terminal operators while in some cases the tariffs that the company is suggesting do not meet the requirements of the authorities. The government and the regulators may also change the corporate taxation during the lifecycle of the LNG terminal. The changes in tax rates will directly affect to the profitability of LNG terminal operators.

Economic factors

The European energy economy has been based on heavy use of natural gas for decades. Measured in terms of terawatt hours there is clearly more gas flowing in the European energy market comparing to electricity. However, natural gas is a fossil fuel that produces CO²-emissions which are not supported in the current energy objectives against fighting the global warming issues. About 40% of the natural gas that is used by in the EU comes from Russia. Dependence on Russian natural gas has been recognized for years, but to the available capacity and price it is not a surprise that the European Energy policy has not been disturbed by this dependence. An example of this dilemma is the almost ready-to-use Nord Stream 2 gas pipeline from Russia to Germany. Due to the resent changes in European safety states and the war in Ukraine the pipeline lays at the bottom of the Baltic Sea unused currently. (Energiautiset 2022.) This example could also be categorized as a political factor that has major effects on economics. As seen on the recent market changes the political decisions have direct effects on the economics in big scale.

The ongoing war situation between Ukraine and Russia has already changed the gas-markets in a big picture. The economic factors that will affect the LNG terminal business can be seen as weaker availability of natural gas that again

pumps the LNG prices up. At this state, many energy users want to boycott Russia bound natural gas and this might not have a direct negative influence on the LNG terminal operators but more likely they will speed up the need for LNG terminal services. On the other hand, the costs of LNG terminal-operators also rise due to the higher transportation costs. The current prices of CO² emission allowances are high compared to previous average prices and that increases the fixed costs of the LNG terminal operators also. In terms of higher priced loans and increased interest rates the investments will be much more expensive today. The LNG terminal business is increasing its market shares in many places and future investments is needed immediately while the demand is high. All this creates economical risks that the LNG terminal operators must cope with in the future.

Social factors

LNG terminal projects can have both positive and negative social impacts in the countries and communities where they are located in. These impacts can be controlled by government laws and industry regulations. Handling the corporate social responsibility can be seen as the "social license to operate." Many of the latest LNG project owners have included the local government and city officials at an early stage of starting the project to gain the trust of the community and that way tackle the negative social factors of the LNG terminal operations in that specific city. The partnership with the local governments will also help the stakeholders to gain, not only the social trust from their partners, but can be a success factor when negotiating a major LNG project in a new location. (Department of energy 2022.)

Social factors are usually more difficult to describe than the economic factors. Social factors are also dependent of the cultures of certain countries and therefore the same approach might not work everywhere the same way. Beliefs and attitudes with different personalities always affect the conversations and cooperation.

Hamina LNG has almost finished the project of building the terminal and will be starting the business within the following months. Therefore, the social challenge might be how to convince the customers to choose their operations over their rivals. Pricing and logistics are of course economic issues, but the location of Hamina LNG terminal might be seen as a social risk by some customers. The terminal's location in Finland might be seen as a risk because it is located near Russia. LNG is transported to the terminal through Baltic Sea and the current unstable situation in Russia can affect the safety of the sea transports. These safety issues are not formed directly due to actions of the terminal operator itself but in risk management point of view the company should have an understanding of how these social risks can be reduced.

Technological factors

In today's business landscape technological values promote competition and affect the market situation in every industry. Technology is changing rapidly and companies must understand how technological factors may impact the organization and the industry. Technological factors include factors such as automation, R&D, technology infrastructure and cyber security. For instance 5G networks and Internet of Things (IoT) are emerging factors that affect energy companies' operations increasingly in the near future. In energy sector the companies should do technological analysis of the industry but also understand the speed that technology modifies the industry. By doing a technology analysis the companies can more easily understand the impacts that the external environment might bring to their business. Technological analysis considers the following aspects: Technology's impact on product offering, impact on cost structure in energy industry, impact on value chain structure in Energy sector and rate of technological diffusion (Fern Fort University 2022).

Besides the IoT solutions that support the development at any industry the energy efficiency is in key role when discussing energy production and usage. The technological components and infrastructure that is inside the typical LNG value chain, includes liquefaction facilities, coolers, storage tanks and similar cryogenic equipment and regasification plants. This technology has existed for

decades, but the focus nowadays is increasing the energy efficiency of processes and components. For example, heat exchangers, gas turbines and compressors are important thermodynamic components in the gas cycle process which can be tuned and developed towards increased efficiency and reducing the losses. Utilizing high efficiency gas turbines could be a solution for improving energy efficiency in LNG-production. Gas turbines that have the latest technology, aero-derivative turbines for instance, can have efficiency of over 60 % and emit less CO²-emissions as well. Due to the light weight of this turbine technology, they are best suited for offshore installation. Common offshore installations also prefer the modularization, where the modules of equipment systems are fabricated somewhere else and the brought to the site as near ready modules that are then fixed together at their final set. Modularization is therefore cost benefit and quality-controlled way of building new LNG-production systems. (Eikens 2021.)

At this moment Hamina LNG terminal is designed to be a storing company for the LNG-fuel. In Europe there are other operators that can produce LNG to the tanks at the same site. In future there might be a possible development step for the Hamina LNG Ltd. to expand their business from storing to also producing the LNG at the port of Hamina.

Environmental factors

The potential environmental impacts of LNG terminal facilities are controlled by the industry and national regulations. Inside the EU the LNG terminal operators are obligated by the emissions trading system. The CO²-emissions are monitored, and the companies must declare the results to the authorities. The goal of the EU emissions trading system is to keep track and control the greenhouse gas emissions of industrial and energy production plants inside the European Economic Area (Ministry of Economic Affairs and Employment of Finland 2022).

When starting the project of building a new LNG terminal it is notable that running the business does not need an environmental permit from the authorities. Still there are some environmental factors that should be considered when operating

the LNG terminal business, such as: threats to aquatic and shoreline environments, marine environmental impacts, hazardous materials management, air emissions management, waste management, noise and LNG transportation. All these factors can be examined and answered when the company is preparing the safety clearance manual for its operations. For example life cycle assessment (LCA) is a well-known tool to evaluate the environmental impacts through the whole life cycle of the product or service. By preparing LCA the company can convince the authorities that their operations have been designed sustainably and environmentally friendly.

Legal factors

Legal factors can emerge from changes in the regulatory environment inside industry. They might be affecting in the broader economy of a nation, certain industry, or individual business in specific sector. In a highly regulated industry, as LNG terminal operations, the legal factors will have similarities to the political factors that were mentioned earlier. Hamina LNG terminal operations represent industry where following regulations and laws is obligated to operate the business. The competitors all share the same obligations as well and therefore it is worth mentioning, that the legal factors are not likely the ones that will give a greater competitive edge over each other.

Safety aspects are important in operating the LNG terminal business. According to the Natural Gas Decree 551/2009 a company that is storing LNG-fuel in tanks that have a storage volume over two hundred tons is obligated to prepare a safety clearance manual for their operations (Finlex 2009). The Finnish Safety and Chemicals Agency monitors the compliance with this Regulation. The obligation to prepare a safety report is related to exceeding the limits of the storage permit application. Hamina LNG terminal's storing capacity is 30 000 m³ which equals to 15 000 tons, so the safety report concerns the storage of natural gas at the LNG terminal at Hamina LNG's Hamina oil port.

The findings from the PESTEL analysis can be supported by having other views from the external environment. In the following section a market analysis and

strategic group mapping are discussed to expand the theoretical background of the study.

2.1.2 Market analysis

A market analysis evaluates the qualitative and quantitative factors in the current market situation that the company operates in. A market analysis helps the companies to understand the value of the market and for example how to seek the potential customer segments, analyze customers' buying habits, understand the competition situation and the financial environment of the industry. A market analysis may be always affected by the industry regulations and other barriers that may arise from the specific industry companies operate in. A market analysis is an essential tool when trying to understand the external environment and competition better. It can offer strategic value when used correctly but on the other hand it may misguide the companies if the analysis is interpreted the wrong way. After all market analysis aims to help the companies to grow their business by having the right information analyzed to the proper use. (Parsons 2021.)

According to Parsons (2021), Market analysis can be divided into four segments:

1. Industry overview – refers to the current state of the industry and the direction it is going to.
2. Target market – the right customer groups and the needs of those who company may aim towards in the future
3. Competition – presents the current position of the company and its rivals within the markets
4. Pricing and forecast – express the economic levels and boundaries that the company must work in order to compete with the rivalries. Forecasting the development of pricing is included in this sector

Conducting a market analysis may be hard inside some industries as it needs significant amount of research and knowledge from the markets. From the strategic point of view the process is not that complicated but it still needs the effort of studying the business and the competitors. With the case company the LNG terminal industry is fairly new in Finland, so the competitors and market analysis need to be studied at European level also. From the industrial point of view, the LNG terminal business is rapidly growing, and the potential customers

may be found from other sectors inside the energy industry. This adds challenges to the market analysis in LNG terminal sector but also enables potential new customer groups that may emerge from outside the current LNG terminal business.

2.1.3 Strategic groups mapping

Strategic group mapping is a tool for analyzing the competition situation inside the industry and markets. Strategic group mapping helps companies to determine their position against the rivals inside the markets. Strategic groups inside the industry can be identified with factors as (QS Study 2022):

- Choices of different distribution channels
- Market segments
- Quality level of product or service
- Technological development
- Vertical integration inside the markets
- Competitive pricing

Inside the industry strategic groups can be defined as groups of competitors that have similar strategies and compete directly with each other with similar products or services. From the customers' point of view these products or services are seen as direct substitutes for each other. Inside the strategic groups the companies may have different relationship with each of the competitive forces. (QS Study 2022.)

Some main factors related to strategic group mapping are (QS Study 2022):

- It helps the company to identify the barriers to entry and exit
- It helps identifying the strategic areas where the benefits can easily be gained
- It helps benchmarking the best companies inside the industry
- It helps in gaining assets for competition against major rival

External environment analysis holds the key elements to understand the factors that are affecting to company's operations from the outside and those factors are uncontrollable by the company. The controllable factors that company can influence are based on company's internal operations. In the next section internal

environment analysis is discussed to illustrate the factors that the company should focus to make their internal operations more flexible and be able to compete better in the markets.

2.2 Internal environment analysis

In the external environment analysis, the focus was on analyzing the customers, competition, and markets. In the internal environment analysis companies or organizations resources are studied from the perspective of the internal processes. By studying internal environment companies can learn how to manage their strategies and how to lead their human resources in order to achieve the full potential of their internal assets. Inside the markets the business is constantly changing the way with the customers are changing their behavior. Markets will evolve and the company's external environment is changing at the same time. For the companies can keep up with the competition, their internal performance needs to be improved as well. If controlling either environment (external or internal) is inadequate inside the company the business may not meet the goals that it has set in their strategy. Constantly changing aspects inside these environments create challenges, but also opportunities, that companies must tackle to succeed in the competition.

2.2.1 Value chain

Understanding a company's actions and how it operates inside the markets means understanding how company is meant to create value to its owners. Value chain thinking considers how company can change the assets or inputs to business outputs that can be sold in the markets. The goal is to gain higher value from the outputs (products or services in this case) that the initial inputs were forth before the refinement. (Johnson et al. 2014.)

On general level value chain activities were invented that the companies could learn how their actions are connected to the final outputs. Value chain structure can be refined as the activities that the company does to create value for its customers and owners. This means understanding the costs structure of the

chain and how the system is linked from the raw materials to final products sold in the markets. In Figure 4 below the different value chain aspects are defined. There are two different levels that consist of different parts in the chain of activities, the primary activities and supporting activities (Johnson et al. 2014.)

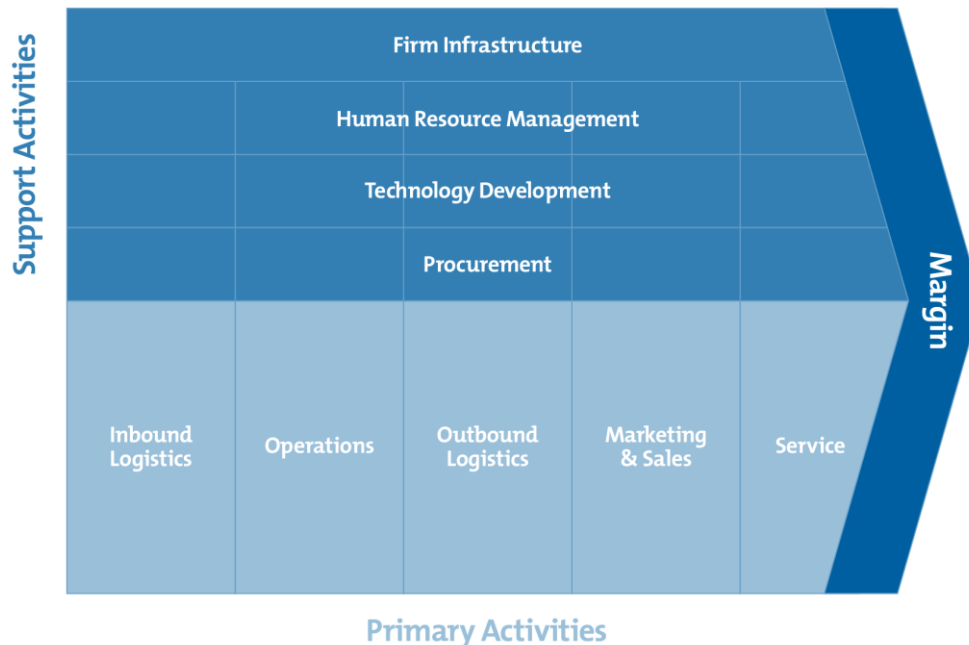


Figure 4. Example of value chain thinking (Johnson et al. 2014).

According to Johnson et al. primary activities consist of the physical processes inside the company. These can be processes of sales, maintenance and supporting products or services. Primary activities are divided into:

- Inbound logistics – Those are the processes related to storing, receiving, and distributing material or services
- Operations – Shows how the inputs will develop to outputs as the final goods that are sold in the markets
- Outbound logistics – The different manners or supply chain processes helping to deliver the products to customers
- Marketing and sales – Actions that are needed to sell the products and compete the rivalries in the markets
- Service – Offering services to maintain the products when they are used by the customers.

Supporting activities are, as stated, the helping processes for the primary functions listed above.

- Procurement – Finding the resources that can be further processed to final products
- Human resource management – Handling the matters and the relations between the company and their employees
- Technological development – All the development that is needed to deliver the best possible value and efficiency inside the processes.
- Infrastructure – The physical premises and assets or tools that is needed for the company to build or offer their services and products to the markets.

While Hamina LNG terminal is not selling a physical product, but an LNG storing service, the value chain activities must be considered more from selling the services point of view. This means that not all the activities are present when solving the value chain for the company. For example, *product services* part needs to be changed to *customer service* in the current business model of the case company.

2.2.2 Resources and competences

Resources and competences analysis is one approach to study companies' internal environment. This approach is illustrating the companies' resources. Key resources can be divided into four main assets: physical, financial, intellectual, and human based. It is important for the companies to define their key resources because it directly affects to companies' value propositions. By creating a unique business model, a company can get a considerable competitive advantage over its rivals. (Shimizu 2012.)

In the resource-based view company's key resources can be combination of internal and external resources. These resources can also be referred as tangibles (tradable) or intangibles (non-tradable). Tangible resources include all the physical assets that companies have such as factories, distribution centers, and stores. The intangible resources are companies' non-physical resources such as employees and their knowledge or skills for instance. (Shimizu 2012.) Figure 5 below shows an example of the tradable and non-tradable assets.

	Material Resources	Immaterial resources
Tradable resources	<ul style="list-style-type: none"> • Machines • Employees • Standard software 	<ul style="list-style-type: none"> • Licenses • Individual expert knowledge
Non tradable resources	<ul style="list-style-type: none"> • Self-constructed facilities (e.g. a special machine to produce bakery products) • Self-programmed facilities (e.g. a special software) 	<ul style="list-style-type: none"> • Corporate culture • Unique relations to stakeholders • Company-specific training • Implicit knowledge

Figure 5. Resources classification (Beinhauer & Wenzel 2022).

Intangible resources can be considered more important compared to tangible resources. Competitors can easily copy the tradable resources but when it comes to employees and their skills it is not that simple. Therefore, the possible risks in the intangible resources should be considered carefully. On the other hand, these nonphysical resources can often be harder to identify compared to materials and machines. If companies succeed in monitoring and managing intangible resources the sources of competitive advantage can be gained and turned to benefits that helps the companies to manage the competition situations in the markets better. (Shimizu 2012).

2.2.3 Competitive advantage

Turning the resources and competences into assets and managing business processes will help companies to gain competitive advantage. Company's internal processes are aiming to create a clear image of how different functions are set inside the company. The size of the company does not matter, because how large or how small the company is, the efficiency of managing processes may separate them from winning or losing the markets. Inside the company the processes may become less important to the management while developing new products are more visible to the customers and therefore gets more focus from the operations inside the company. Developing and innovating processes is still important because research repeatedly shows that processes are more important

to a company's success these days. Efficiency and fluent processes will help the companies to cut costs and compete with price better inside a regulated and highly competed markets. The first steps to gaining a competitive advantage from business process management is by starting to look the processes from beginning to end. The focus should be on the whole process, rather than just aiming to develop the narrow functions and gaps inside one subdivision. (QAT Global 2022.)

Broken or inoperative business processes can be avoided if business process management practices and technologies are used correctly. According to QAT Global 2022 for example:

- Modeling processes helps companies to achieve visibility in their actions
- Management of business rules helps companies to achieve compliance and consistency in their operations
- Optimizing processes or simulating processes helps companies to discover problems and test different scenarios
- Making processes visible and monitoring business activity identifies process-related problems

2.2.4 Industry and market overview

The current war situation in Ukraine and the ongoing fight against global warming and CO²-emissions reduction has changed the global energy markets rapidly. The energy and climate targets have increased the race between alternative energy forms, the competition that had been already toughened in the latest decade. The self-sufficiency of nations and countries has been put to examination when the reliability of other countries is seen not as self-evident anymore. This has also affected to improving security of energy supply in many countries. In Europe, the energy markets have opened to favor LNG at an accelerating pace.

European gas markets

In 2021 The EU's gas demand was around 400 billion cubic meters. Only about 10 % of the EU's current gas needs are achieved by domestic production. The rest is imported from Russia 41 %, Norway 24 %, and Algeria 11 %. EU is the biggest importer of natural gas in the world. From energy security and

competitiveness point of view diversification of different supply sources is therefore very important. In the past energy has created a tight connection between Finland, Europe, and Russia. Energy trade has traditionally endured political upheavals and changes in international politics. Electricity and natural gas have flowed evenly to Finland in the past but currently the situation is different. Trade and economic relations have become politicized. At the same time, trading risks have increased. The war situation in Ukraine and the economic downturn has affected the price of natural gas and other petroleum products. At the same time, the rise in the price of fossil natural gas has improved the competitiveness of biogas. This helps not only the conversion to greener energy forms, but also the faster exit from fossil fuels. (Energiautiset 2022.)

Finnish gas markets

The most significant Russian products for the energy industry have been natural gas, electricity, and wood fuels. In addition, liquefied natural gas, coal, pellets and peat are imported from Russia. In 2020 natural gas that was imported from Russia to Finland was 1,5 billion cubic meters, worth 232 million euros. This equals to around 65 % of all the natural gas imported to Finland in 2020. Natural gas is also imported to Finland via the Baltic connector pipeline. This Estonian connection helps the energy security of supply in Finland, but still some of this Estonian gas is based on Russian sources. (Energiautiset 2022.) Currently the Russian gas deliveries to Finland are closed and the transition from fossil to bio-based energy is increasing, these factors naturally open the markets for alternative fuel sources such as LNG. Figure 6 shows the existing Finnish and Baltic gas network.

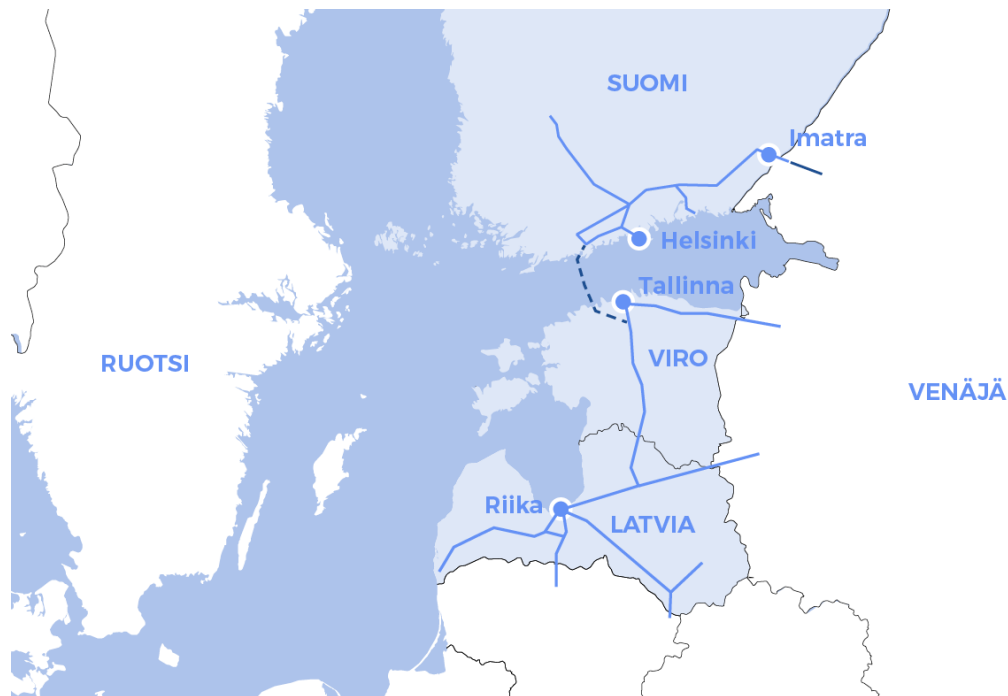


Figure 6. The Baltic - Finnish gas network (Gasum 2022).

European LNG markets

Demand for LNG is growing in the EU. In 2021 total of 13 EU countries imported around 80 billion cubic meters of LNG. LNG is transported by tankers around the world and stored at LNG terminals. One of the EU's biggest LNG terminal is located in Klaipėda, Lithuania. In recent years, the share of imported LNG has stabilized to about 20 % of total gas demand in the EU. Most of the imported LNG is coming from the United States 28 %, Qatar 20 %, Russia 20 %, Nigeria 14 %, and Algeria 11. In 2021 Qatar was the world's largest supplier of LNG with supply of about 170 billion cubic meters per year. (European Commission 2021.)

It is worth noting that in 2022 the political situation has rapidly changed and the impacts on energy industry has also been considerable. The Russian LNG, as the natural gas also, has been under sanctions and the risks of Russian based energy has increased. While LNG is one way to replace Russian pipeline gas it still needs alternative producers to potentially replace the Russian LNG. The benefit of LNG is that as a convenient energy raw material it can be transported around the world, stored, converted from liquefied to gas and again used in the natural gas network.

Finnish LNG markets

Currently there are two operating LNG terminals in Finland, in Pori and Tornio. They operate outside the reach of Finnish gas network so they cannot feed gas nationally to network which is in southern Finland. Hamina LNG is building a third LNG terminal in Hamina, and the benefit of their location is that it will be connected to Finnish natural gas network.

In 2020, 176 000 tons of LNG was imported to Finland. Majority of this amount, 137 000 tons, came from Russia. Previously most of the world's LNG was used in Asia but the demand for LNG in Europe and Finland is growing. In Finland, natural gas is used by large and medium-sized industry and in the energy sector as fuel. Natural gas is used to produce district heating and electricity in combined heat and power plants. Industrial users may use natural gas for their processes in many ways. The downside of natural gas is that its competitiveness in energy production has weakened due to high taxation and more expensive emission rights. (Energia uutiset 2022.)

In Finland energy companies have lately been publishing their zero CO²-emissions programs and therefore the use of natural gas is decreasing rapidly. The crisis in Ukraine has also been accelerating this development. On the other hand, the markets have opened new possibilities to LNG-operators to gain the market shares from natural gas users. The bio-based LNG is also one emerging product that could be easy to sell to companies and industrial customers. The domestic households that use natural gas are seeking for alternative energy forms for heating the houses. The existing Finnish gas network could be used as a platform to sell bio-based LNG that is vaporized for the domestic users in the future.

Future trends

One increasing future trend of LNG business is LNG bunkering of ships. The shipping industry has been using LNG for many years, but the development will continue heavily towards LNG bunkering of ships in the following decades. Due

to CO²-regulations and sulfur emissions-regulations, the usage of LNG as bunkering fuel on ships will be increasing and exceeding the fossil fuel usage. LNG has been declared as a great alternative to high sulfur fuel oils (HSFO) that are commonly used as the main fuel for the shipping industry up to this date. The development of technology will help to produce better LNG-compatible engines, gas only engines that already exist, but most commonly dual fuel engines are used at today's marine fleets. (Eikens 2021.) Hamina LNG terminal has a great possibility of expanding the business towards marine industry while the terminal already has the ability to offer bunkering services when it initially opens to business. The business risks can be reduced when the company has several different customer groups that it can serve, such as national gas network customers, maritime and land transportation customers.

One of the latest projects in the Baltics to replace the Russian natural gas is a LNG terminal vessel that Gasgrid Finland Ltd. and Excelerate Energy Inc. have announced. The LNG terminal vessel (also called FSRU) is basically a big floating LNG terminal, similar to those that are situated on the continent. The terminal ship is located in the port of Inkoo. The port already has a near ready infrastructure to the vessel and it is near the Baltic connector network. The floating terminal is meant to connect to the gas network and then it can produce gas to Finland and Estonia, after the LNG has been re-vaporized into gas. The LNG is shipped to the vessel the same way it would be shipped to inland LNG terminals. The LNG vessel has a volume of 68 000 tons and therefore it is going to be a significant LNG terminal in Finnish scale but also a big competitor to the existing Finland's LNG terminals. (Gasgrid 2022.)

2.3 SWOT analysis

In trying to decide if their ideas for running the business have possibility to succeed, the companies should first find the components that can help these ideas to work or fail. Common tools to illustrate these factors are PESTEL analysis combined with SWOT analysis. SWOT and PESTEL analyses are both aiming to help the companies for their decision-making actions. They point out the companies' strengths and weaknesses against the external and internal

environment the companies work in. PESTEL and SWOT frameworks share some similarities but the main difference between these two approaches is that SWOT analysis focuses both on the external and internal environment while PESTEL analysis finds solutions against external environment only. When combined these two approaches can help the companies to understand the market situations better and how one is performing compared to the rivals. (Woodruff 2019.)

What is SWOT?

SWOT analysis can be seen as a process of examining four business environmental specific areas that are pointing out the company's strengths, weaknesses, opportunities, and threats in their operations. Strengths are recognizing company's possibilities that it got to overtake the business and manage the competition against its rivals. Weaknesses refer to lack of the factors that may cause the company to fail in the competition. Opportunities describes the company's possibilities that it is not already using but that can help the business to grow in the future. Threats are pointing out the factors that may cause negative effects on the company coming from the external environment. (Woodruff 2019.) By using SWOT analysis, the companies can help to forecast the future and benefit, or tackle, the factors that are considering the operations of the company coming from the external and internal environment.

Hamina LNG terminal SWOT

The SWOT-analysis illustrated in Figure 7 below consists of internal factors (strengths and weaknesses) and external factors (opportunities and threats). These factors are considered to affect to Hamina LNG terminal company's operations. The factors are based on the PESTEL analysis that has been presented in the external environment analysis section above. The SWOT analysis has been created to provide an overview of the external and internal environments effects that are influencing the case company's operations.

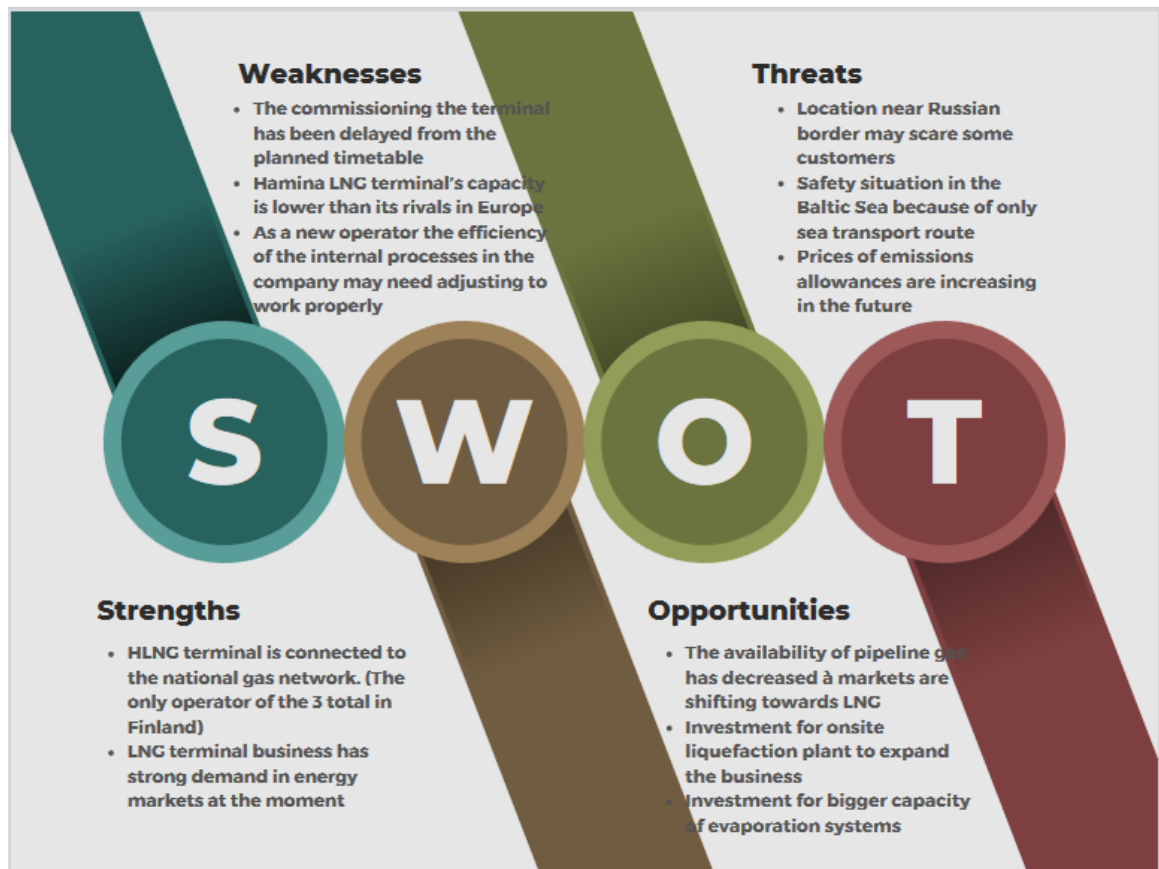


Figure 7. Hamina LNG SWOT (Lampinen 2022)

The SWOT analysis shows that when the commercial use of Hamina LNG terminal starts it already has a great potential to answer to the market needs in terms of LNG demand. Still, the full potential of the company needs to be strengthened to overcome the unpredictable factors that are coming from the external environment. Especially those that are threatening the business operations from the political and market point of view. Economically the company needs to start making investments to meet the arising demand coming from the potential new customers and altering energy business that the future is forecasting.

3 DATA COLLECTION AND DATA ANALYSIS

Data collection and data analysis examines how the thesis is conducted. In the beginning the research process and the selected research methods are described. The aim is to justify why the selected research methods support the data collection and data analysis and how they can be further used to achieve the study's objectives. Data collection and data analysis are relevant to the study to ensure that the research data and processes are reliable so the limitations of the study can also be identified.

3.1 Research process

Methodological research can be described as a creative process that has the characteristics of a cycling never-ending circle and continuing development. The cycling process challenges the researcher to rethink the methods and return to any step of the process to deepen the study. This way the research process gives the researcher the opportunity to understand the causes and the potential effects that changing the perspective during the study process could offer. Cycling process, or spiral process, can be utilized whether the research method is qualitative or quantitative. (Blaxter et al. 2010.) The circular research process is shown in Figure 8.

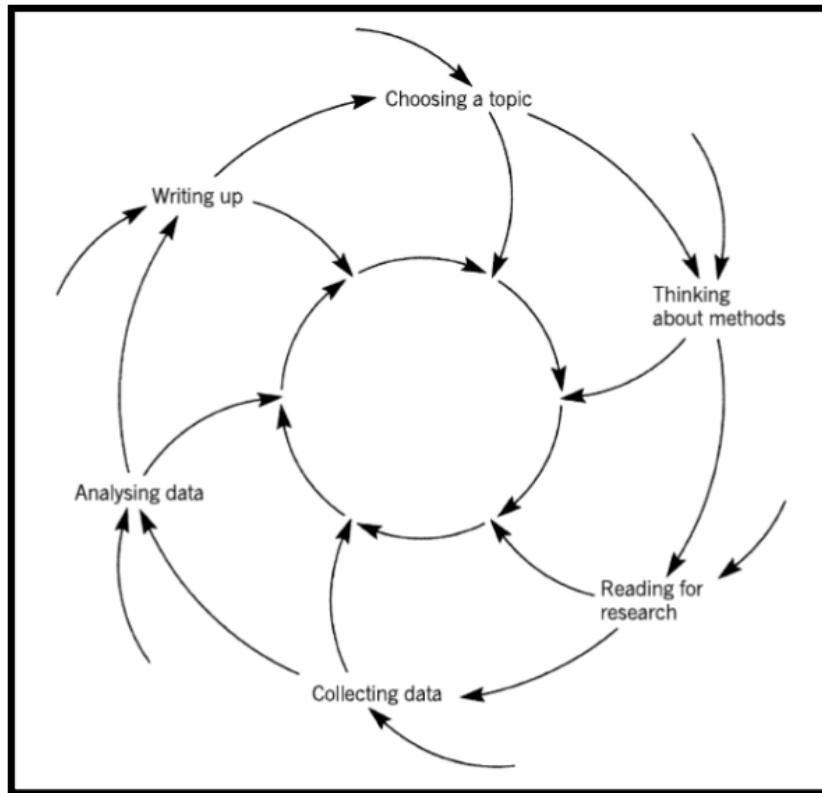


Figure 8. Circular research process (Blaxter et al. 2010)

Research processes and research methods can be considered as techniques and strategies that enable the initial data collection and data analysis. Research methods provide ways of discovering new information and how to create a better understanding of the study to which it is targeted to. Research methods can be divided into many different categories but on a general level the research methods are quantitative or qualitative types. Quantitative research methods consist of studying and analyzing numerical data. The figures and calculations aim to present the final findings via tables, charts, and graphs. Qualitative research methods are based on non-numerical elements that are seen as unquantifiable. The major difference to quantitative method is that qualitative data cannot be analyzed by mathematical techniques the same way. (Dudovskiy 2020.)

This thesis project started by the idea of the commissioning company. The research problem and research questions are based on Hamina LNG Ltd.'s needs to find out with what limitations they can operate their business and how to

improve the competitiveness of their services. Qualitative research methods were selected because the data used in the study was collected by interviews and exciting information from the industry and LNG markets. The research questions are based on non-numerical information and examining factors that cannot be quantified so therefore the qualitative research methods are justified. The theoretical background of this study is based on analyzing the business environment, both from the internal and external perspective. Different analysis tools were studied and reflected to the company's operations at the same time. For example, making the PESTEL and SWOT analysis from the case company's point of view gave a clear picture of the current state, but also the upcoming challenges the company might face when the industry is changing in the future.

The primary research data was collected through interviews which were then analyzed, organized, and interpreted. In the beginning of the study the limitation in the amount of the interviews was noted while the nature of the LNG terminal business is seen as a special field of industry with not that much of possibilities to operate differently compared to other operators in the industry. The potential customers operate only in B2B-field, so the number of customers is limited in this industry. Customers' behaviors are also quite homogenous so the services that LNG terminal operators can offer are therefore similar between the rivals. Once the data was gathered with the interviews the findings were analyzed and compared to the theoretical background and the findings on the business environment analysis. This way the circular research process was followed during the whole process. The final conclusions and proposals are presented in the end of the study. The answers to research questions are followed by suggestions for development process and future studies.

3.2 Data collection

Data collection in this thesis is based on qualitative research methods. The data collection for this thesis is conducted in two phases, primary data collection and secondary data collection. Primary data is collected via semi structured theme interviews and the secondary data is based on the market overview and existing documentations from the industry.

3.2.1 Qualitative research

Qualitative research may include many different methods such as case studies, interviews, studying phenomenology or phenomenography or ethnography, narrative and hermeneutic analysis, discourse analysis, and action research and observation (Eskelinen & Karsikas 2012). In this thesis the qualitative research approach focuses on the interview research and case studying. The data collected from the interviews is used to analyze and form the results as the basis of which the final conclusions and development ideas are formed.

In qualitative research the use of interviews, as a data collection method, is based to examine a pre-selected group or individuals. The questions that are selected to the interviews may consist of open-ended questions or questions that are divided into different themes. The objectivity of interviews in qualitative research is based on the assumption that the researcher does not follow one's own beliefs, attitudes, or values about the research subject. Objectivity can be achieved when the researcher stays separate from the interviewee and does not allow external interaction to guide the course of the interviews. The main goal of the researcher is to find the perspectives and expressions of the interviewee, and not to give their own preferences for the discussions. In other words, the interaction between the researcher and the researcher is based on trust where the interviewee can share their own ideas without the influence of other parties. (Tilastokeskus 2022.)

In qualitative research the data that is obtained is aimed to collect, understand and organize according to the four main methods that are shown in the Figure 9 below. These methods include secondary data collection, observation, participation, and interviews. Participation and observation must be divided into separate activities, although they can be thought of as one method of data collection. The researcher's own participation usually influences the course of the interaction, while observation is based on the researcher's own observations without outside influence on the object that is studied. It is also important to note that the collection of secondary data demonstrates how existing data from

previous studies can be used in future studies. The word secondary does not therefore refer to obsolete or secondary information in this case. (Eskelinen & Karsikas 2012)

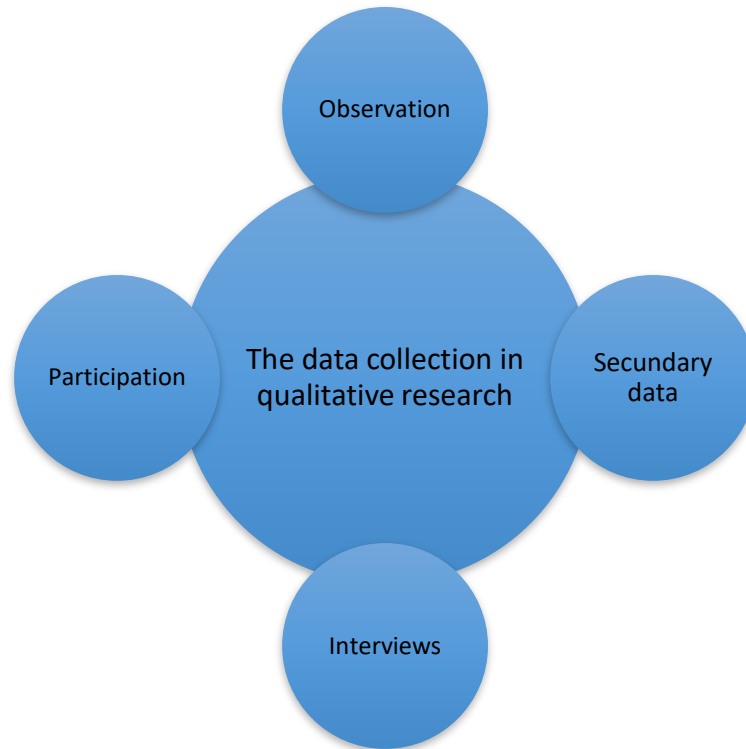


Figure 9. Qualitative research data collection methods (Eskelinen & Karsikas 2012)

In this thesis the methods for data gathering is focused on interviews and secondary data collection.

3.2.2 Primary and secondary data

Primary data collection

Semi structured interview, or theme interview, is classified as a discussion type interview method, which is one of the most popular methods in Finland for collecting material in qualitative research. Semi structured interview has a looser structure compared to a structured form interview and there are more pre-defined questions compared to open interviews. (Aaltola & Valli 2015.) Semi structured interview is used as the basis of the primary data collection in this research.

The characteristics of the theme interviews is that the order in which the actual questions related to the research are handled is not decisive for the outcome of the interview. The order in which the themes are discussed may change as the interview progresses and the course of the interview may be different in different interview situations. However, if the research problem requires the issues can be arranged in a pre-selected format. Theme interview is characterized by its conversational progress but is has a clearly defined purpose in advance. Theme interview cannot be compared to an ordinary everyday conversation. In a theme interview it is important that the structure of the interview remains under the control of the interviewer at all times. The strength of theme interviews is that the obtained data is based on the thoughts and experiences of the person being interviewed. On the other hand, the researcher has the responsibility to ask questions that are relevant to the research problem and guide the discussion so the answers are relevant to the topic. The weakness of theme interviews is that the interviewee may begin to lead the discussion in the wrong direction. In this case the different interviews and the data obtained are not comparable. The danger for research in this situation is that the material will only form a confusing collection of different people's views. Afterwards it is then difficult for the researcher to build a clear picture from the acquired data. (Tilastokeskus 2022.)

Primary data collection started as the author tentatively planned the themes and interview questions that would be used in this research. The actual data collection started with interviewing the case company's Chairman of the Board and the CEO on 14th of June 2022. In this interview the final guidelines for the interview themes were created and some of the questions were formed. The persons and companies that would be interviewed were also selected at this meeting. The participants that were selected for the interviews were chosen by their experience and knowledge from the gas energy sector. After this phase the researcher created the final interview questions and contacted the predefined persons and companies. The list of interviewees is shown in Table 1 below. The decision was made with the case company that the interview target groups would be weighted towards public and government sector more than the customers group. Due to trade and business secrets of the commissioning company the

customer perspective was catered from other primary data sources, not directly through the interviews.

Company/Organization	Person	Background	Interview style
Ministry of Economic Affairs	-	Authoritative	No answer
Energy Authority	Tiina Karppinen	Authoritative	Teams
Finnish Safety and Chemicals Agency	Suvi Perälä	Authoritative	Teams
Finnish Safety and Chemicals Agency	Arto Jaskari	Authoritative	Teams
The Kymenlaakso rescue department	Timo Kuossari	Authoritative	E-mail
Centre for Economic Development	Jaakko Vesivalo	Authoritative	E-mail
Finnish Gas Association	Hannu Kauppinen	Authoritative	Teams
P2X Solutions Oy	Herkko Plit	Customer	Teams
Rohe Solutions Oy	-	Customer	No answer
Haminan Energia Oy	-	Customer	No answer

Table 1. The list of interviewees (Lampinen 2022)

Theme interviews that were done in this research were mainly held via Microsoft Teams application. The benefit of MS Teams-meetings is that in today's world of work they are considered a normal meeting style that is equal to face-to-face live meetings without the need for travelling. The invitations and interview themes were sent via e-mail to the interviewees. The example of the invitation e-mail is presented in Appendix 1.

Themes in the interviews were:

- **Responsibility** (environmental, political, social)
- **National security** (security of supply, political situation)
- **Competitiveness** (market situation, competitors, customers)
- **Regulation** (laws and industry requirements, emissions trading, emission permits, safety requirements)

The interview questions consisted of open questions only. The decision was made, that multiple choice questions not used because due to the specialty of the LNG industry their added value was not considered to be very high in the context of this study. The interview themes and questions were emphasized according to the target group of interviewees. Different questions were developed for different target groups and inside the interviews different themes were weighted according to the background of the interviewee. The interview themes and interview questions are presented in Appendix 2.

Total of 10 energy business experts were contacted and asked to join for the interviews. As a result 5 were interviewed via MS Teams, 2 wanted to give their comments via e-mail correspondence and 3 were reluctant to participate. One challenge with arranging the interviews was the time period when the interviews were held. Due to the summer holiday season some initial candidates were not able to join the interviews inside the proposed time period. Since the intended group size was relatively small and 7 out of 10 participated in the research the result can be considered as a success. The expertise level of the interviewees is strong and their competence level inside energy industry is diverse so the reliability of the research can be considered good.

Secondary data collection

In academic study, secondary data sources refer to existing available data that is collected by other researchers in the past. Secondary data collection is a widely used method in case study research because it is relatively easy to implement and the data is usually well available. Secondary data can consist of government publications, websites, books, journal articles, internal records or professional business publications for example. The downside of this method is that the available data may not suit the researcher's needs perfectly and several sources are needed. Once the secondary data is gathered the researcher should examine how valid and reliable the data is. Secondary data can be used to confirm and compare the findings from the primary data. These are for example (Benedictine University 2022):

- Identify and validate the research problem
- Develop a strategy to achieve the solutions for the research problem
- Construct a sampling plan
- Formulate the research design
- Find out the answers for research questions and to test hypotheses
- Interpret the primary data
- Validate the findings in qualitative research
- Identify the potential problems in the research
- Obtain the needed background information and to improve the credibility of the study

In this research the goal of secondary data gathering is to support the findings from the interviews (primary data). This means that the available documentation and existing studies were used to complement and to verify the findings from the interviews. In this research secondary data collection also includes the business environment analysis and benchmarking the competitors in LNG markets. The chosen methods for secondary data usage are justified by the specialty of the LNG industry sector. Energy markets are highly regulated and the companies that are operating in the industry follow the same laws and work under the same restrictions. This way comparing the competitors gives a wide view where the industry is currently heading and how the competitive edge could be reached. The industry overview and benchmarking the competitors also helps to examine the customers' perspective of this research.

3.3 Data analysis

In qualitative research the most problematic stage of theme interviews is making interpretations from the collected data. The material that is obtained from the interviews and the issues that are raised by the interviewees represent a first degree interpretation. For the researcher this might cause problems because the goal of the research is to form a second degree interpretation based from the first degree data. This means the researcher must conduct theoretical thinking and be objective with the data. (Tilastokeskus 2022.)

The data gathered with interviews, and especially with theme interviews, can be organized with thematic analysis method. Thematic analysis is deeply inductive where the themes are guided by the data and not by the researcher itself. In this method the data collection, analysis and the theoretical framework of the study can be done partly at the same time during the process. Thematic data analysis follows the circular research process method that was illustrated earlier in this chapter. This allows the supplementing of the data and gives the researcher a possibility to move backwards and forwards between the primary and secondary data. The main goal of the thematic data analysis is to recognize the essential themes and topics that are relative to the research problem. This allows more

detailed and comprehensive exploration of the data and helps to categorize the results better. (Jyväskylän Yliopisto 2010.)

Thematic analysis can be conducted by a six step process that helps how to identify, analyze, and report qualitative data. According to Braun & Clarke (2006) these six steps are:

- 1) Familiarizing yourself with your data
- 2) Generating initial codes
- 3) Searching for themes
- 4) Reviewing themes
- 5) Defining and naming themes
- 6) Producing the report

For this research the six steps method was selected as it offers a flexible research tool that is theoretical but also supports the guidelines of the thematic data collection and theme interviews. For qualitative data analysis this method also provides a clear approach for the research problem. This helps the researcher to connect the data from primary and secondary sources. Six steps data method is illustrated in Figure 10 below. In practice, this research process followed the six steps. Once the primary data was gathered, the information from the interviews was summarized, combined and categorized by themes. After this the interview findings were compared to secondary data findings. That way triangulation was implemented in this research. When the results of the data were formed all the data findings from primary and secondary data were reviewed to each other several times during the research process.



Figure 10. Six phases of thematic analysis (Researchgate 2016).

4 RESEARCH RESULTS

The analyzed results of the research are presented in this chapter. As the research was conducted by using primary and secondary data, and different themes inside these methods, the results are also presented with the same differentiation. The primary data results include the interview data that was combined, analyzed and summarized from the interview discussions. The secondary data findings reflect the business environment analysis that was presented in chapter 3, supplemented with benchmarking the LNG terminal business operators in this chapter. Each data source is analyzed separately and the overall results with key findings are summarized into a PESTEL analysis that is presented at the end of this chapter.

4.1 Interview findings

As a result from the interviews, the conclusion was made that while the energy industry, and LNG terminal operations to be exact, are regulated quite heavily there are still not that many mandatory certifications that are controlling the industry. The certifications in energy industry can be seen more as mandatory development for answering the markets needs and to create competitive advantage over the rivalries between the operators. Bio-based energy products and energy sources are the ones that need to be certified, but bio products are not mandatory for the energy operators to use. The regulatory verifications on the other hand have more obligating forces over energy industry.

Responsibility

Responsibility actions is one of major themes inside today's business life. Among energy sector this means that operations needs to be done to ensure the sustainable development of energy sources, both from environmental and social point of view. According to the research data and regarding to guarantee of origin, while LNG is categorized as fossil fuel the responsibility issues are concerned mainly political, ethical and social. The current European political atmosphere repels Russian based energy sources and the most important subject that customers are interested is that the energy sources are not based

from Russian sources. This on the other hand was also seen as a social dilemma because while the energy and fuel prices have rapidly gone up some of the operators might still be using Russian based fossil fuels due to their competitive price. The limited amount of energy sources, other than Russian based, are developed risks to markets that customers and energy operators have not met before. While many energy operators advertise themselves supporting green values and have their own targets in CO² free production, the increased energy prices have put them to rethink how to manage the increased markets production costs. According to the research data, certifications (for biofuels) were seen as good instrument for monitoring and guiding the energy operators to follow their local targets. The non-mandatory bio-certificates can be said to speed up the energy industry to fulfill the emissions reduction obligations. The political atmosphere was assumed to turn the situation suddenly when fossil fuels reduction pressure might lead changes in the law. Especially in Europe the pressure to restrict the use of natural gas as households heating energy was seen to open markets for bio based energy sources. Currently there are not such laws but the preparation work has been started. The laws that regulate the use of fossil fuels might be temporary or permanent.

National security

Security of supply in the Finnish and European energy markets has historically been dependent on fossil fuel based energy products. The development of energy markets and the future requirements for greener energy has put gas business into a tough spot where the natural gas that is coming from Russia needs to be replaced with other solutions. While the national gas network is existing, and many energy users rely on it, the need for pipe gas is relevant for the security of supply in the future also. The interview data showed that LNG would have potential to replace the natural gas from this point. From the security of supply's point of view the existing gas network infrastructure is seen sufficiently confirmed while Hamina LNG terminal and the new FSRU ship in Inkoo, as the Baltic connector pipeline, has the ability to deliver gas to Finnish gas network and vice versa. Many interviewees stated that while the infrastructure is well covered the availability of LNG might be the issue in the near future. The upcoming winter

2022-2023 will show if there will be or not enough gas available for the gas users along the gas network. This on the other hand gives Hamina LNG terminal the edge over other Finnish LNG terminal operators while it can deliver gas to the national gas network.

Sudden changes from legal aspects were not stated to be seen during the following winter but the experts assumed that some restrictions for limiting the amount of distributed energy could happen. This might lead to changes in the laws of energy distribution and safety stocks of the energy storages. The spare energy sources of fossil fuels, such as peat for example, could be given lightened taxation for a limited period of time if the energy demand needs to be ensured by alternative energy sources. Still the most obvious energy taxation reliefs in longer time perspective are related to biofuels and bio based energy sources. EU countries have clear climate targets that were expedited by the uncertain safety situation and restlessness over Ukraine so the legal changes would be related to inadequacy and environmental aspects of energy sources. National safety factors of different energy production plants and LNG terminals was not currently seen endangered by the political atmosphere. Some preparations are made for exceptional situations but the legal changes were seen to relate more to Finland's NATO joining process. Locally the tightened safety situation of Hamina LNG terminal and the Port of Hamina was seen static at the moment by the local rescue department.

Competitiveness

The guarantee of origin has increased its value in energy sector when bio-based gas products have gained more interest from the customers. For LNG terminal operators this means that if the operator wants to store bio-based gas the product needs to be certified according to the Renewable Energy Directive (RED). LNG can be certified as Bio LNG by meeting the ISCC sustainability certificate requirements (International Sustainability and Carbon Certification). According to the interview data ISCC certificate was categorized as non-mandatory certification. By gaining the non-mandatory certificate, this was seen to increase the interest of the customers and will give competitive edge in the LNG terminal

markets in the near future. On the other hand the non-mandatory ISCC certificate was seen as mandatory to the future development and competitiveness of the entire LNG Terminal business.

Under political, social and environmental pressure the LNG business needs to change to meet these requirements to ensure its market share in the future. This allegation was confirmed in the research data from the perspective of the natural gas markets. The natural gas markets are seen as “transfer time product” that will have higher demand until 2040th century but after that the other energy forms have obtained its market share. For example the market share of hydrogen was seen up to 25 % of the European energy markets until 2050 century. For LNG operators ISCC certificate can bring competitive edge over other energy sources. For instance LNG terminal operators could use bio methane to Bio LNG services and advert their operations with ISCC certified products. With ISCC certificate the LNG industry shows that it is trying to work towards sustainable world with the following themes (ISCC 2022):

- Implementation of zero-deforestation
- Protection of land with high biodiversity value and high carbon stock
- Protection of soil, water and air
- Compliance with human, labor and land rights
- Measurement and reduction of greenhouse gas emissions
- Traceability throughout supply chains
- Integration of smallholders in international supply chains
- Compliance with laws and international treaties
- Good management practices

When applying for the ISCC certificate the LNG operator must first register the product with the proof of origin that shows the input material is BIO-based. After the registration the company must do an internal audit that prepares for the external certification audit. When receiving the permit to use ISCC certificate the company can prove that the whole product chain is meeting the RED requirements and the output can be sold as Bio LNG. (ISCC 2022.)

Earlier in Finland there was a separate certificate for biogas but after the RED 2 directive was announced the old system is gradually about to change to new guarantee of origin system for biogas. The new obligation to verify the origin of CO₂ emissions free gas and hydrogen with a guarantee of origin will start on 1

July 2022. In Finland the Energy Authority is the supervisor for monitoring the system and Gasgrid Finland Ltd. is the register administrator. The new guarantee of origin register (T-REX in Finland) can be used to transfer the guarantee of origins between EU/EAA countries initially but at the starting phase of the system this is not yet possible (Gasgrid 2022).

Regulation

The prices of CO² allowances have pressure to increase in the future. The development towards CO²-emissions reduction and fight against global warming is setting energy industry, among many other industries, into position where the energy production and fuels that are used is one of the clearest targets for the authorities to hit to achieve the CO²-emissions reduction requirements. Many interviewees stated that there will be a very high price for carbon in the future and that the price will be put to any consumer goods that people are using. Therefore not only energy but all the products that are bought from the stores or used have a higher price tag in the future. For LNG terminal operators, and LNG producers, this will put pressure to find solutions that support these climate targets in order to find growth to their business, or even to maintain their market shares.

According the research data, the demand for natural gas based LNG was forecasted to decline in the following decades the operators need to start to develop and invest to new infrastructure that supports sector integration and the use of hybrid energy sources. Bio LNG is something that can be utilized as a first simple step. With the current RED 2 program the regulations and certifications for bio LNG were seen sufficient at the moment from energy authority's side. Sector integration on the other hand will mix the usage of different energy sources and add pressure to authorities to find new solutions to certificate and regulate energy industry. For instance for bio-hydrogen there is currently developing a market that does not have regulations or certifications ready at the moment. There is development work going on in the EU to prepare the regulatory environment over this new market area.

Safety aspect is important in the LNG terminal business. In the gas energy sector there are laws and regulations that controls the industry. Building a new LNG

terminal is a long process that requires cooperation and statements from different authorities. In the beginning of the process the LNG terminal operator needs to consult local city officials in site and land use issues to apply the construction license. Finnish Chemicals and Safety agency (TUKES) and local Rescue Department are guiding and controlling the construction phase closely. The process of meeting the requirements in gas network and storage construction sites is illustrated in the Figure 11. Filling stations, storing, and distribution network and installation pipework equipment also needs to meet the legislative requirements related to natural gas, LNG and processed biogas systems. LNG is categorized as flammable gases that involve risk factors of leaks, ignitions, fires, explosions and carbon monoxide poisoning (TUKES 2022.) According the research data the use of natural gas, biogas and LNG have been regulated strictly throughout the history of natural gas usage in Finland. That way the operational safety of LNG terminal operations is kept on high level throughout the construction process to the operational use to avoid damage and accidents. Hamina LNG terminal was stated to be one of the safest LNG terminal compared to others in Finland. Safety issues are concerned thoroughly by the local rescue department and TUKES in the construction phase of the terminal. Licensing a new LNG terminal and storing LNG needs to meet the following laws and regulations:

- 390/2005
- 551/2009
- 685/2015
- SFS-EN 13645
- SFS-EN 1473

The local rescue department also draws attention to:

- Site risk assessment
- Rescue plan
- Fixed extinguishing systems
- Prerequisites for operational rescue operations
- Structural fire safety and other accident prevention and limiting the effects of accidents.
- A possible increase in LNG cars fueling services and the associated risk scenario of losing the car's vacuum. (This scenario is not directly a terminal risk, but the accident can have significant effects, especially if it happens in the port area)

How to meet requirements

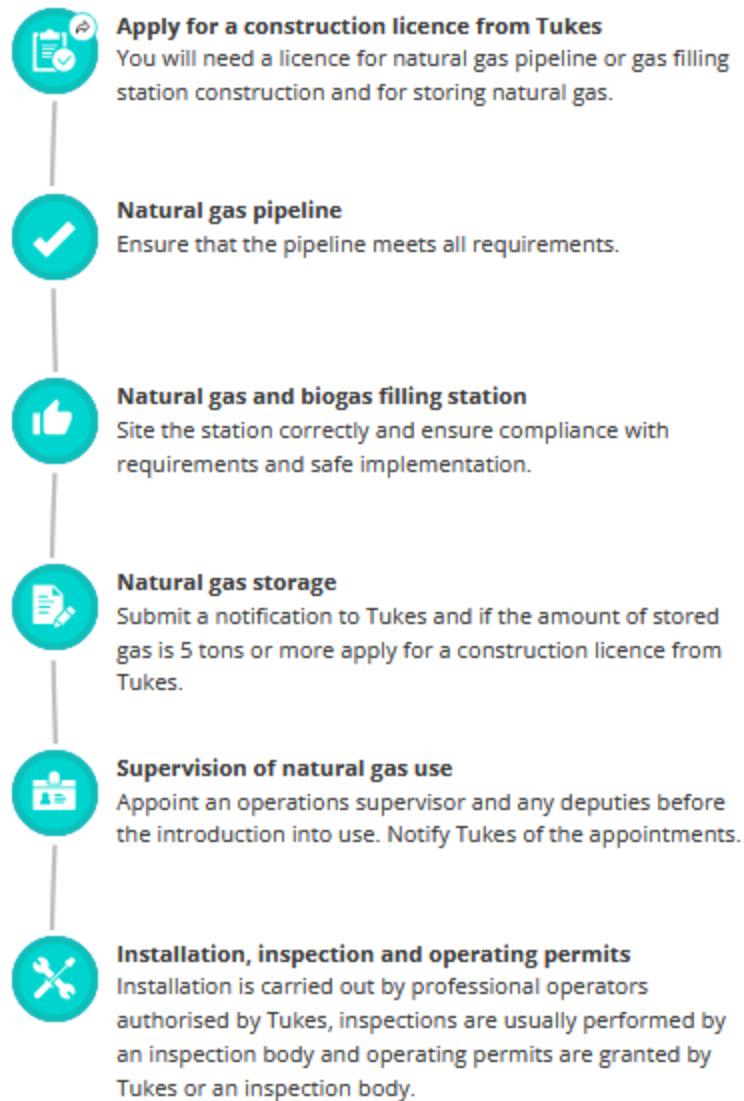


Figure 11. Process of constructing gas storage and gas pipelines (TUKES 2022.)

When operating an LNG terminal there are legal responsibilities that need to be followed. According to installation of natural gas equipment act 558/2012, chemical safety law 390/2005, and pressure equipment law 1144/2016, operating the LNG terminal there needs to be designated person for the following certificated responsibilities:

- the supervisor of the use of dangerous chemicals
- pressure equipment operation supervisor
- natural gas installation supervisor

The person/persons designated to the responsibility must successfully pass examination and declare their information to register that is preserved by TUKES.

According to LNG terminal safety aspects, the local rescue department mentioned the legislative changes that are requested for statement currently. The government has proposed changing the safety of handling dangerous chemicals and explosives act section 19. The primary goal of the proposal is to improve the safety level at sites covered by the current chemical safety act. At the same time the general safety of society would be promoted. The aim of the proposal is to protect important legal rights from significant violations. The goal is to develop the safety level of chemical and explosive targets by including in their protection measures. This also includes essential factors in terms of preparing for security threats by setting technology-neutral minimum requirements for preparing for security threats.

The act 390/2005 requires updating LNG terminal's safety clearance at least every 5 years. In addition, from the local rescue department's side the update must be done at least for the following reasons:

- a major accident has occurred in the production facility or a change in operations has occurred that increases the risk of a major accident
- significant developments have taken place in safety technology, hazard assessment and technical knowledge
- aspects that need to be taken into account have emerged in the investigation of accident or near-miss situations
- On request of TUKES

4.2 Secondary data findings

The aim of secondary data findings in this study is to support and extend the findings from the primary data interviews. In this subchapter the market situation of LNG industry is reflected to the predicted future of energy industry. The earlier discussion of business environment analysis in chapter 2 was describing the current state of energy and LNG industry. Below the future prospects of LNG industry will be added to these earlier reflections. The competitive situation of Hamina LNG terminal is also clarified by benchmarking some of the closest rivalries of the company in the LNG terminal sector. The aim is to explore what certifications other LNG terminal operators have and that way figure out how the case company could strengthen its competitiveness in the markets.

Finnish Gas Association has drawn a picture for Finland's gas vision by 2050. In this supposition the energy cluster consist of smart and energy efficient systems that is supported by many energy forms. Future energy production and usage is seen as platform based solutions that utilize the sector integration in many ways. There will be not only separate energy production sites, but combined solutions that can transfer energy both ways. The existing networks for gas, electricity and heat are seen as the platforms that will offer the base for the energy transferring. The strict borders between seller and customers are changing while everyone can represent both parties depending on the market situation. The visions for the gas energy sector in Finland is illustrated in Figure 12 below. (Suomen Kaasuyhdistys 2013.)

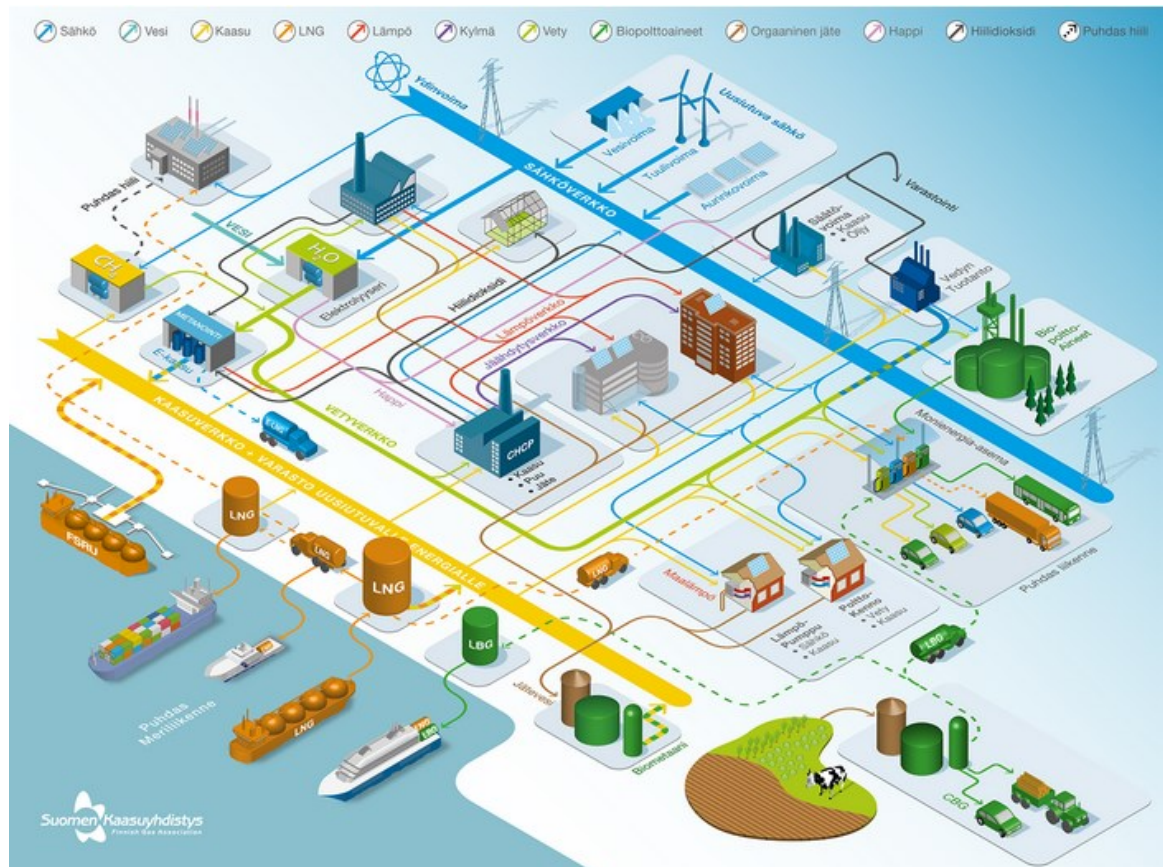


Figure 12. Finnish gas vision 2050 (Suomen Kaasuyhdistys 2022.)

In the gas vision 2050 LNG has clear role in replacing natural gas and changing the gas network sources towards greener energy forms with Bio LNG. In the Finnish LNG terminal network Hamina LNG terminal has great possibilities to grow their services while the terminal connected to the national gas network.

Different gas sources are offering fast and cost efficient solutions towards sustainable and clean energy industry but they need to have proper distribution channels to operate well. The benefit of gas based fuels is that they are easy to bring in to use with moderate modifications for energy production. Gas based fuels can also be used as they are for example in maritime and road traffic sector. The different gas sources that are seen as future trends are (Suomen Kaasuyhdistys 2013.):

- natural gas
- LNG
- bio LNG
- bio SNG (Synthetic Natural Gas)
- E-Gas (renewable electricity to methane conversion)
- hydrogen

The competition in the energy markets is however tightened. Energy consumption is decreasing and the prices of energy is tending to grow. Different solutions are developed to bring the production costs down and add CO² free energy production to answer to the climate goals that are set. The latest visions for new energy networks are focused for EU wide hydrogen network that is under development currently. Gasgrid Finland would like to build an extensive hydrogen network alongside the natural gas network in Finland. This would connect Finnish hydrogen production with the hydrogen network planned for Europe (Gasgrid Finland 2022.) When the hydrogen network will be built hydrogen can be seen as direct competitor for gas network and indirectly for the LNG Industry. Figure 13 illustrates how the hydrogen network is planned to be built by 2040.



Figure 13. Hydrogen network 2040 (EHB 2022)

4.3 Benchmarking the competitors

Pori LNG Terminal

The first LNG terminal that started its operation in Finland was built in Pori. This LNG terminal is owned by Gasum Ltd. Pori LNG terminal has a storing capacity of 28 500 m³. Pori LNG terminal offers LNG and Bio LNG fueling services to maritime and land traffic vessels. While the terminal offers bunkering services to vessels it can also offer third party storing services for customers. Pori LNG terminal is not connected to the national gas network and its services are targeted more to industry and heavy traffic customers. The benefit of Gasum is that it has its own Bio LNG production plant in Turku. Gasum has also developed their own trademark for the customers who use their Bio Gas. Customers can use

the Bio Gas trademark (Figure 14) supporting marketing and communicating their environmental responsibility of their processes and products. (Gasum 2021.)



Figure 14. Gasum Bio Gas Badge (Gasum 2022)

In addition, Gasum's Bio Gas production has been granted with "Joutsenmerkki" which is part of EU Ecolabel brand. The Finnish swan badge (Joutsenmerkki) is a voluntary environmental labeling brand that communicates company's efforts towards environmental actions. Companies can apply for the badge for their products or services that meet the criteria set for them. Nordic environmental labeling has drawn up criteria for around 60 different product groups. The criteria take into account the most significant environmental impacts for each product group over the entire life cycle. For liquefied and gas fuels' swan badge there are criteria that needs to be met to get the right to use this badge. Swan-labelled fuels have strict requirements for raw materials. It means that the fuels must be 100% renewable raw materials or mixtures of renewable and fossil raw materials. Fuels and renewable raw materials must meet the requirements for, among other things, traceability and sustainable production, and certain raw materials are

prohibited. Raw material requirements reduce environmental impacts, safeguard biodiversity and save the earth's resources. (Ympäristömerkintä Suomi Oy 2022.) Swan Badge can be seen in Figure 15 below.



Figure 15. Finnish Swan Badge (Ympäristömerkintä Suomi Oy 2022)

As a conclusion, Gasum is committed to operate under the following certified management systems:

- ISO 9001 Quality
- ISO 14001 Environment
- ISO 50001 Energy
- ISO 45001 Occupational health and safety
- ISCC (Turku Bio LNG plant)
- Finnish Swan Badge (Joutsenmerkki)

Tornio LNG terminal

The other Finnish LNG terminal is located in Tornio. The terminal is owned by Manga LNG Ltd. The LNG terminal is a joint project between Outokumpu Ltd., SSAB steel mills, EPV Energy Ltd. and Gasum Ltd. The LNG terminal is built by Wärtsilä Ltd. and it started its operating in 2018. The Tornio terminal's LNG storing capacity is 50 000 m³ which makes it the biggest operating terminal in Finland. This terminal serves mostly local industrial customers and LNG is delivered to the customers via local connection pipeline. Other industrial

customers and filling stations are served by road tankers. Maritime customers can receive road tanker deliveries or will be bunkered directly from the terminal. Manga LNG terminal serves the entire Bay of Bothnia region and industrial and mining operators, maritime transport and heavy duty road transport in Northern Finland, Sweden and Norway. The biggest customer of Tornio LNG terminal is Outokumpu Tornio steel mill, EPV Energy and SSAB in Raahe. (Manga LNG 2022.)

While Manga LNG terminal serves mainly the local industrial customers, some of whom are also the owners of the terminal, the public marketing of the terminal is not that visible. Comparing to Hamina LNG the Tornio LNG terminal is not a direct competitor because the lack of third party customers that it is missing. Tornio terminal is not connected to the national gas network so the competition situation will not likely to be formed in the near future either. Tornio LNG terminal is not advertising whether they have the voluntary certificates to ISO standards. The terminal rules follow the industrial regulations and ATEX-certificate is mandatory for the ships that operate during the LNG transport. Ships operating in the port area are required to follow the ISPS certificate (International Ship and Port Facility Security Code) but this is mandatory for all the LNG ships in the European region.

Klaipeda LNG terminal

One of the biggest LNG terminals in Europe is located in Lithuania Klaipeda and it is operated by KN. Klaipeda LNG terminal consist of Floating Storage Regasification Unit (FSRU) that has 4 different storage tanks with total volume of 170 000 m³. Klaipeda terminal on its own has a bigger volume compared to Hamina LNG and the other two Finnish LNG terminal operators together. Klaipeda LNG FSRU terminal has unloading and reloading capacity of 9 000 m³/h that makes it fast and important operator to European gas business, while the terminal is also connected to European gas network. As regulatory and policy perspective Klaipeda LNG terminal is committed to operate under following requirements. (KN 2022.)

- KN applicable regulatory, environmental, occupational health and safety legal and other requirements and obligations

- international standards
- best industry practices
- ISO 9001 standards requirements
- ISO 14001 standards requirements
- ISO 45001 standards requirements

Klaipeda LNG terminal has partly been funded by EU's financial assistance through HEKLA and Blue Baltics projects. The aim of these projects was to develop the LNG infrastructure and green energy usage in the Baltics area. The project was also promoting the use of LNG as a clean fuel that can reduce pollution in the maritime transport sector in the Baltic Sea Region (KN 2022). Referring to these projects the environmental responsibility of Klaipeda LNG terminal can be seen through these actions. The company does not on the other hand advertise their green values through their communications channels that well. Klaipeda LNG terminal business does not follow any other eco labelled certificates that the environmental certification ISO14001.

Zeebrugge LNG terminal

Zeebrugge LNG terminal is located in Belgium and it is been operated by Fluxys LNG Ltd. Zeebrugge LNG terminal has total capacity of 380 000 m³ in four different tanks and it is connected to European gas network. The company offers services for reloading and unloading any type of LNG ship, proceeding to transshipments between LNG ships, loading LNG trucks, regasifying LNG in order to inject it into the transmission network, liquefy gas in order to have LNG in the terminal without needing a ship and getting Bio LNG liquefaction capacity. Fluxys Ltd. is committed to promote the European hydrogen network process and the capture, reuse and storage of CO² solutions. Fluxys is been working with the European Hydrogen Backbone Initiative to achieve these goals in the future. However the company have not certified their operations with the energy ISO standards. The company have certified the risk management system according the ISO 31 000 and the environment operations with ISO 14 001 certificates. In addition the company's entities involved in construction projects are required to be SCC certified. SCC certification entails a checklist covering health, safety and

the environment aspects and it is used in Netherlands but not internationally. (Fluxys 2022.)

The Zeebrugge LNG Terminal is certified according to the ISCC framework and it offers Bio LNG services. This allows the terminal to be part of a Bio LNG supply chain and ISCC certified shippers to obtain a Bio LNG certificate. The LNG terminal is certified as a conversion-unit transforming biomethane to Bio LNG. There are two ways for the customers to obtain Bio LNG in the terminal. The customer can bring gas with biomethane certificate to the terminal and with the ISCC certified conversion service the terminal offers it will be converted to Bio LNG. After that the customer can store and sell their products as Bio LNG. This method is illustrated in the figure 16 below.

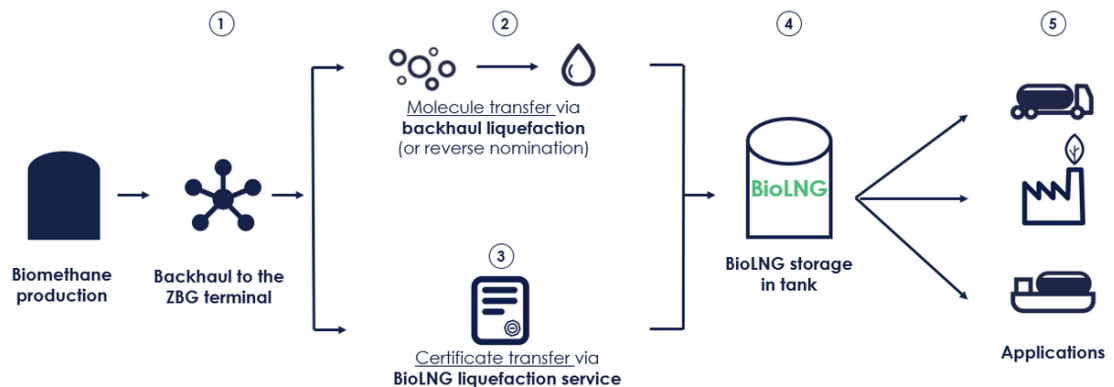


Figure 16. Bio LNG conversion method 1. (Fluxys 2022.)

Another way is the customers to store their pre-certified Bio LNG and use it for different applications as ready Bio LNG product. Figure 17 below illustrates the process for this method.

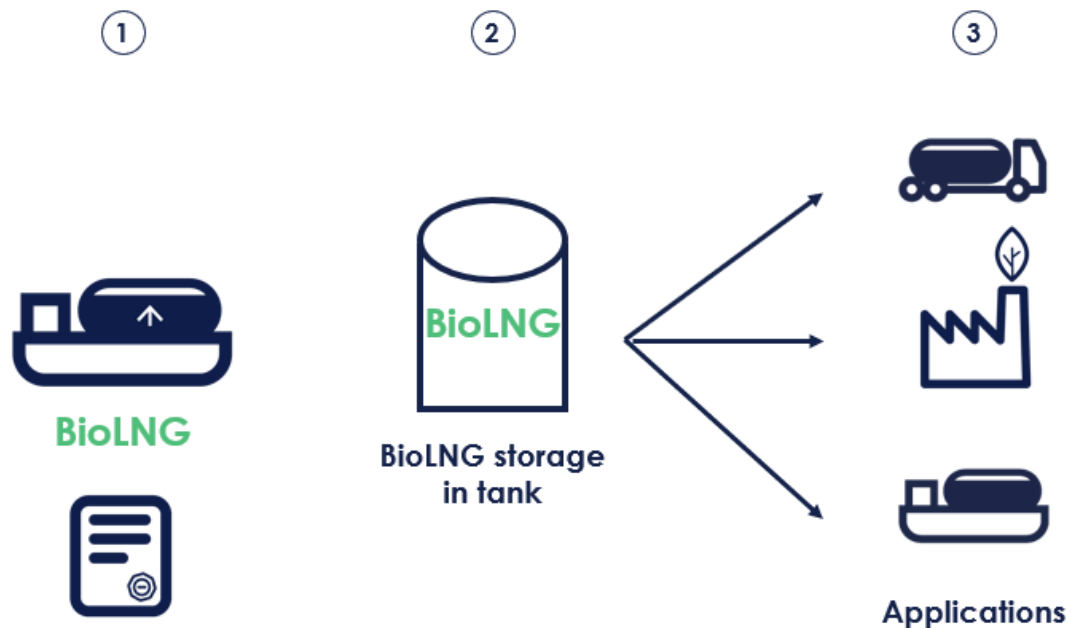


Figure 17. Bio LNG conversion method 2. (Fluxys 2022.)

Fluxys informs that they are expanding the LNG terminal capacity in the future and the demand for Bio LNG products are rising. In consultation with the market and federal energy regulatory (CREG) Fluxys has developed a regulated service package for Bio LNG. This helps customers to operate with the company and works as means of marketing as well.

ECOVADIS

Ecovadis is a sustainability assessment system that measures company's business sustainability performance. With the Ecovadis platform the service providers and customers can share information regarding sustainability performance, reduce risks and develop innovations in their activities. Ecovadis network consist over 60 000 businesses that held inside nearly 200 industry categories in 155 countries. Ecovadis assessment process starts by registering the company online. The rating continues by answering to questionnaire that is followed by an expert review of the company's performance. As a result the company gets rating from its performance that can be compared and benchmarked with other companies at the same business sector. Ecovadis assessment has several levels that indicates company's activities from

environmental, ethical, labor/human rights and sustainable procurement aspects. Ecovadis scorecard is a voluntary certification assessment that helps the companies to build a reputation as reliable and sustainable operator inside the business environment they operate. (Ecovadis 2022.)

Inside the energy sector Ecovadis assessment can be used to develop the value of supply chain sustainability. Energy sector is facing increased pressure from tightening regulative environment which directs the energy companies to focus on cost effectiveness of their supply chain management. Companies may develop strategic sourcing programs that are aiming to reduce the costs of energy production or procurement. Ecovadis assessment helps to manage risks while increasing the sustainability of the processes. One example from a global company using Ecovadis assessment is UPM Ltd. UPM Sourcing uses Ecovadis to assess its suppliers that covers themes: environment, labor and human rights, ethics and sustainable procurement. UPM sourcing is rated to the best Platinum level of the assessment program. By having Ecovadis certificate UPM is also marketing and sharing information as a reliable company that has a high level in corporate responsibility. (UPM 2020.)

4.4 PESTEL analysis of Hamina LNG

The results of the primary and secondary data analysis are combined and converted to a PESTEL framework below in Figure 18. The PESTEL analysis helps to understand how the mandatory and non-mandatory laws and regulations is affecting to the LNG terminal industry both from the internal and external environments perspective.



Figure 18. PESTEL framework of the data analysis (Lampinen 2022)

The PESTEL analysis in Figure 18 is considered from the Hamina LNG terminals operations point of view. Based on the research findings the mandatory laws and regulations are dominating in the political, economic, legal and social sectors. These factors can be considered as the minimum level that the LNG terminal operator needs to fulfill in order to run the business. The non-mandatory certifications are seen inside the technological and environmental sectors. These factors consider mainly authenticating the bio based energy products and factors that can provide competitive edge inside the LNG markets.

5 CONCLUSIONS

Summarized in Table 2, the voluntary certifications of the LNG terminal rivalries are illustrated. Pori LNG terminal is operated by Gasum and as they have the most advanced voluntary certification system. The ISCC certificate of Gasum

consider the Bio LNG production site in Turku. Tornio LNG facility is focused on the local industrial customers and it is not serving third party trade. Therefore the information from the certificates the terminal possibly have was not available. The bigger European LNG terminals Zeebrugge and Klaipeda have certificated their processes alternatively. While Klaipeda informs the wider range of ISO standards they follow, Zeebrugge terminal is the only company that has the ISO 31000 in use. When the data from the certificates, which the companies follow, was collected the challenge was the lack of information the companies' message to public. As a development idea for Hamina LNG, when they standardize their operations, the certificates should be marketed and communicated clearly to the customers. According the research data, customers expect to have information that is easily accessible especially in the responsibility and environmental matters.

Certificate	Pori LNG	Tornio LNG	Zeebrugge LNG	Klaipeda LNG
ISO 14001	X		X	X
ISO 9001	X			X
ISO 45001	X			X
ISO 50001	X			
ISO 31000			X	
ISCC	(X)		X	
Swan Badge	X			

Table 2. The voluntary certifications of the rivalries (Lampinen 2022)

5.1 Key results and findings

Hamina LNG starts to operate the LNG terminal later this year and it has a potential to deliver gas to the national gas network in Finland. In the beginning the terminal has a capacity of 3 TWh/year of gas that it can deliver to the network. The capacity can be increased with investments to double the original amount. According the research data the markets have a steady demand for pipe gas in the future, although the demand might be decreasing, but from the viewpoint of security of supply the future visions can be seen as stable for years. By investing to bigger evaporation capacity Hamina LNG could increase its market shares in the future by selling more capacity to gas network operators.

LNG terminal operators inside the EU are following the mandatory laws, regulations and industry-specific guides well. They advertise the environment responsibility through their actions, but according to the research data, the non-mandatory certificates are not that commonly in use or advertised by the industry operators. With the case company this means that to gain competitive advantage over other operators by validating their environmental operations they could stand out from the competitors with the green values that the customers are clearly expecting more in the future.

The rapid changes in energy industry, due to Russian war actions and green step towards sustainable future, have created a major demand for alternative energy sources. While effort is made to replace natural gas based energy with other energy sources, LNG has gained a market share and grown its demand. Still the research data questioned that while LNG has higher demand currently the demand will most likely settle in the following 5 years. This is due to decreasing energy markets and energy usage in general but also the fossil fuel based energy sources shifting towards CO² free energy forms. For LNG this opens the opportunity to change the production towards Bio LNG sources. Bio LNG needs to be certified according to the Renewable Energy Directive (RED) and it can be done for example with ISCC certificate. Based on the research findings Bio LNG markets is seen as mandatory development step for the gas business to ensure its competitiveness in the future energy markets.

To achieve the objective of this study the main research question considered what certifications and verifications are needed to operate the LNG terminal business. The research data clarified that verifications are referred as the mandatory regulations that are guided by the laws. Certifications are more of the non-mandatory and business developing objects. As a result, the verifications of the LNG industry are coordinated by the laws and regulative environment monitored by the authorities. When starting the LNG terminal business there are several acts that guides:

- construction license of the terminal
- gas pipelines
- gas filling stations

- gas storing
- installation permits

When the LNG terminal is in the commercial use the facility needs designated person with the legal rights for operating the terminal. This also means that the terminal activities are monitored by the authorities. The monitored factors consider:

- triffs (allowed return)
- emissions trading system
- safety and inspections

The sub research questions where if the LNG terminal business can be operated without certificating the processes and what certifications can provide competitive advantage compared to the rivalries in the LNG terminal business. The research data showed that while the regulative environment considers the mandatory aspect, the LNG terminal business can be operated without certificating the processes. However, according to good business practices and to achieve competitive advantage in the markets, the internal and external processes of the company should be certified some way. The ISO certifications should be the base of the operations. Certificating the case company's processes according to ISO standards 9001, 14001 and 45001 is recommended. Customers, and energy markets, are interested increasing the use Bio fuels and therefore the step towards Bio LNG would be clear step for the case company. If the company intends to be a producer of Bio LNG in the future this needs to be certified according the ISCC certificate. The research data also pointed out that while the certifications the company has are important for the marketing and building trust between the customers and the company, the most important is part is to be a loyal and predictable operator towards the customers. Customers still expect steady prices and appreciate the easiness of doing business. In addition, the origin of LNG needs to be discussed openly with the customers. Companies may have different approaches towards the ethical questions and the seller needs to be prepared to clearly clarify the origin of LNG if the customers insist so.

5.2 Reliability and validity

The data collection and data analysis was conducted in a structured way. The chosen methods supported the research problem and managed to fulfill the aim of the study. The areas of improvement in this study are related to diversity of primary data. While the chosen group of experts that was interviewed consisted mainly from authorities the customers' perspective was not covered as widely as planned in the beginning of the study. However the secondary data collection and market environmental analysis helped to improve the validity of the customer perspective.

The interviews were carried out in a structured way and the discussions had relaxed atmosphere but they still focused on the subject well. The amount of data that was produced from the interviews was sufficient for the data analysis part. The chosen group of interviewees was done accurately. This was proofed by the fact that the interviewees had answers to the questions and no one was redirecting the inquiry for the interview to another person. The participation rate of the interviews was 70 %. The total amount of interviewees was limited and to improve the validity of primary data it would have been reasonable to increase the number of interviewees. This statement concerns the customer perspective only. From the authority's perspective, many of the subjects that were discussed in the interviews had similar reflections regardless from the person. This testifies that the available knowledge, and data, that the authorities have was reliable and valid. All the experts had deep understanding with the subject. The quality of the primary data can be considered good and multiple viewpoints appeared. In addition the secondary data covered the findings lacking from the primary data. The business environment analysis and the competitors benchmarking supported the findings from the primary data as expected. The secondary data gathering was made from the base of the interview and research questions. This way the whole data gathering and data analysis processes was kept homogenous within the process. Also the theoretical background was followed through the research process.

5.3 Managerial implications and future development ideas

As a result of this case study the major findings show that the need of LNG terminal services have increasing demand in the near future. The development ideas according to this research were found from the primary data interviews that were mainly weighted towards energy business experts statements. To widen and execute the key findings of this research the future research topic should relate to the customer perspective and how to apply the eco labels for the Bio LNG. While during this research the case company has not started the commercial use of their services the customer perspective was treated to a limited extend. After Hamina LNG terminal finally opens for commercial use the customers' expectations and requirements are more suitable and relevant to study more precisely. After Hamina LNG terminal operations have started it would be important to develop the services together with the customers. Open and discussive atmosphere helps to create long term relationships between customers and service providers. Understanding the needs of both parties also helps LNG terminal industry to remain competitive against other energy products and the possible changes in the political and legal operating environment. As a future development idea for the next researcher it would be reasonable to pay attention to the timing of the

The need of energy industry to shift towards CO² free production and green energy forms directs companies to certificate the bio based products. As a development step from this research the Bio LNG certificates, for example ISCC, could be more thoroughly investigated. To create the processes for handling Bio LNG could be a future investment for the case company that helps in the competition in the LNG and energy markets. This opens possibilities for the case company to research solutions for producing LNG, Bio LNG or Synthetic gases at the same site the terminal is situated. Customers expect transparent actions and ease of operations when doing business. Bigger customers expect that the seller's processes are certified and they operate sustainably. Green values and human rights needs to be visible for the customers. Therefore it would be useful to obtain some non-mandatory eco label to strengthen the company's image, both for the domestic and international customers. Ecovadis sustainability

assessment or Finnish Swan Badge could be a reasonable investment to build trust towards the customers.

Another development idea considers raising the input capacity of gas to the national gas transmission network. This technological development step requires modifications to low pressure evaporators so they can be used as high pressure evaporators. The modifications do not need major changes from the regulative point of view as increasing the steaming capacity proceeds with the notification procedure through TUKES. If the company wants to invest to additional LNG tanks the process is similar to building a new terminal. This requires the comments from the local rescue department and permission from TUKES.

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Hei,

Olen tekemässä YAMK-opinnäytetyötä Hamina LNG Oy:lle. Teen selvitystä LNG terminaalitoimintaan kohdistuvista vaatimuksista, kuten vastuullisuus, kansallinen turvallisuus, regulaatio ja kilpailukyky.

Tiedustelen, olisiko sinulla mahdollisuutta keskustella aiheesta haastattelun merkeissä? Esittäisin max tunnin mittaista teams-haastattelua ja olisin kiitollinen, mikäli tällainen järjestyisi.

Mikäli koet, että et ole oikea henkilö vastaamaan kysymyksiini niin toivoisin, että voisit osoittaa viestin oikealle henkilölle.

Ystävällisin terveisin,

Mikko Lampinen
MBA opiskelija
Kaakkois-Suomen Ammattikorkeakoulu

General Info

- The background of the interviewee?

Responsibility (environmental, political, social)

- what certifications are needed to operate the LNG terminal business?
 - iscc, iso, ecovadis
- Ethical questions
 - How does the global political situation affect the image of LNG?
 - How important is it to verify the origin of LNG? (The country where it is produced)
 - Russian gas vs other countries
 - Is there need to stretch the rules due to availability issues
 - How far the supply chain is necessary to ensure that ethical issues are adequately addressed?
 - e.g., corruption, use of child labor, workers' rights

National security (security of supply, political situation)

- What do you think is the role of LNG terminal operations to ensure security of supply in the future?
 - How do you see the role of Finnish LNG terminals compared to European?
- What is the future availability of LNG in the Finnish / European market?
 - What role will LNG play as a fuel in the future?

Competitiveness (market situation, competitors, customers)

- Which certifications could achieve a better market position compared to competitors? (Inside European markets)
- What future requirements do customers have for LNG terminal operations (e.g., biogas, hydrogen, liquefaction service)
- What certifications are required to gain new customers?
 - What without it is impossible to act
 - Is there something that is necessary to gain trust with the customers

Regulation (laws and industry requirements, emissions trading, emission permits, safety requirements)

- Guarantee of origin and their significance for the industry? (How to verify biogas?)
- Are there already any known changes in the future legislation that affects the operation of the LNG terminal? (authorities)
 - Changes in terminal activity monitoring? (Environmental authorities)
 - Permits and authorization to expand terminal operations in the future? (Does it follow the same formula as for the current operation?)
 - Known legislative changes? (Emission licensing authorities)
- How will the market for CO²-allowances develop in the near future?
 - Short vs long time perspective