Professional MBA
Entrepreneurship & Innovation

Integrating renewable energy sources in marinas and nautical ports in Croatia: An innovative smart grid concept and business plan.

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
Professor Robert D. Hisrich Ph.D

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Vienna, Austria, 30th of June 2017

Affidavit

I, **MIRCEA PREDA**, hereby declare

1. that I am the sole author of the present Master's Thesis, "INTEGRATING RENEWABLE ENERGY SOURCES IN MARINAS AND NAUTICAL PORTS IN CORATIA: AN INNOVATIVE SMART GRID CONCEPT AND BUSINESS PLAN", 67 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 30.06.2017

Signature

Acknowledgement

This Master Thesis was written as the last project on the MBA study at the University of Economics and Business in Vienna, Austria.

Two years of study have been very inspiring, developing me both professionally and personally. The thesis would not be feasible without the engagement from valuable key persons that deserve to be thanked for.

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30th June 2017, Vienna

Mircea Preda

Abstract

Main objectives of this master thesis are to identify and assess the introduction of renewable energy sources in marinas and nautical ports, jointly with existing environmental programs building on the quality and environmental management and monitoring differentiators and demand estimation tools to achieve competitive advantage. The document explores the current status and drivers of smart grid disruptive technologies, as well as latest technological concepts to propose an integrated solution driving sustainable development towards the achievement of a zero emission marina. With the purpose to address such need, a smart grid concept is proposed integrating a hybrid renewable energy sources distribution system, energy management software and an IOT platform as a turn-key solution. The current scarcity of RES integration in marina operation, as well as increasing favorable market pull and technology push policies, have created an environment fostering innovation with first-mover advantage opportunities. With the emergence of such turn-key solution integrators, the thesis also aims at establishing an efficient methodology for such vehicles to provide a viable venture with a strong emphasis on customer preferred product attributes. Towards the achievement of the proposed objectives the author has decided on international literature review, an electronic audit of official websites of the marina operator electronic survey and business plan for the proposed concept. The results confirm the initial hypotheses and establish in a convincing matter that RES can be integrated into marina operators in line with current environmental programs through a viable smart grid concept. The originality of this master thesis lies in research of recent, international literature on the subject and empirical research performed resulting in the start-up launch proposal of an innovative turn-key solution integrator for marinas and nautical ports in Croatia.

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List of Abbreviations

AMI – Advanced Metering Infrastructure

AMR – Automated Meter Reading

BESS – Battery Energy Storage Systems

BIPV – Building Integrated Photovoltaics

CPS – Cyber-Physical Systems

DG – Distributed Generation

EMS – Environmental Management System

FEES – Flywheel Energy Storage

HESS – Hybrid Energy Storage Systems

IOT – Internet of Things

IWMS – integrated workplace management system

MG – Micro grid

MNP – Marinas and Nautical Ports

MSDC – Marina Sustainable Development Concept

NG – Nano grid

OEM – Original Equipment Manufacturers

PV – Photovoltaic

QMS – Quality Management System

RES – Renewable Energy Sources

SG – Smart Grid

SMES – Superconducting Magnetic Energy Storage

UC – Ultralight capacitors

WT – Wind Turbine

1. Introduction

This first chapter introduces the reader to the topics covered in this thesis in a way that encourages further reading. The literature review provides information of the area of research and leads to the problem discussion where the topics are narrowed down to the one of interest. The chapter ends with the aim of the research that is answered within this thesis.

1.1 Problem formulation

With recent developments in environmental legislation such as the Paris Agreement and the adoption of Sustainable Development Goals on Sustainable Energy of All (SDG 7 aiming at accelerating programs on energy efficiency and renewable energy), there has been a sharp increase of renewables targets and policies at country level. In part, this is due to the vast benefits of renewable energies to meet off-grid and distributed demand. The multitude of support schemes driven by market pull and technologies push policies have created an environment fostering RES innovation, in which companies often benefit from a first-mover advantage in developing solutions to address this need. At the same time, the Marinas and Nautical Ports sector has become increasingly aware of the need of RES in their operations and have developed sustainable concepts towards achieving a zero emission operation. This in part is due to the shifting focus of the customers towards two primary drivers: quality and environmental management and monitoring for sustainable development which have become the main valuation tools to estimate actual demand as a competitive advantage among operators. Exploring the landscape of disruptive RES technologies to fit the novel techniques of MSDC we can observe a rise in smart grid networks, with a future focus emerging from individual energy devices and analytics towards complete integration. The ended results is mastering of the operating system of all internet of things (IOT) devices within industrial, commercial and residential sites. Addressing the integration of RES in MNP's operations, the paper will explore a smart grid concept focused on the integration of hybrid RES (wind and solar), energy management systems and IOT platforms creating an integrated solution for marina operators. Smart Marina will help operators achieve further sustainable development, explore off-grid expansions and resolve the lack of RES integration in MNP operation through the achievement of a significant competitive advantage.

Addressing the topic and problem, three research questions have been drafted to cover the main streams of research:

Research Question 1: Whether and to what extent can Renewable Energy Sources (RES) integrate into the environmental management systems and programs of marina operators in Croatia to achieve further sustainable development?

Research Question 2: Whether and to what extent a cloud-based IoT Platform can foster smart grid technologies, such as a RES powered micro grid and energy management system, in a feasible integrated solution for marina operators in alignment with global trends?

Research Question 3: Whether and to what extent the Smart Marina concept of incorporating a RES powered micro grid and IoT platform can present a viable business venture?

1.2 Objective of the thesis

Based on the three research questions identified and indicated above, corresponding specific objectives were developed and used in the research process of this master thesis:

Objective 1: To identify, analyze and assess the theoretical background, frameworks and empirical evidence concerning renewable energy sources and their integration into the environmental management systems and programs of marina operators in Croatia towards achieving further sustainable development.

Objective 2: To identify, analyze, the current status, drivers of micro and smart grid disruptive technologies as well as explore the latest integration concepts for cloud base IoT Platforms that can foster smart grid tech and energy management systems into one integrated solution.

Objective 3: To propose a concept and business plan for a viable venture through the incorporation of a RES powered micro grid and IoT platform and assess the importance of proposed product attributes with marina operators.

1.3 Method overview

Addressing the research process, the pursued course of action consisted of a three-phase approach to my investigation, designed specifically to enable the approach of formulated problems and objectives effectively. Respectively, the research process is based on three principle stages, related to different sources and consequently research methods. The base-start involved subject-matter literature review, with the aim to have the most up to date literature reviewed, analyzed and draw first conclusions.

To gain a good understanding of the project environment, an opportunity analysis and market and support scheme analysis was concluded (Appendix H). The purpose was to detail further country characteristics, the electricity market country overview and trends, RES related legislation, RES Targets and support policies as well as a detailed summary of support schemes to possible bootstrap the venture for the target country Croatia. Combined, the information in the two analysis deliver all elements of a PEST analysis to build the concept and business plan further and provide the adequate base of information moving forward.

The core of my research was conducted in the form of electronic audit technique, a non-reactive scientific method which entails the use of a structured questionnaire for analysis of the content of website portals. Also, electronic audit technique, a non-reactive scientific method has been conducted through the use o a structured questionnaire to analyze the content of the website portals for the intended market customers, suppliers, and competitors.

Official website portals of marina operators in Croatia were examined, with the rationale for electronic audit stemming from transaction costs economics, and new institutional economics, which focusses the attention to information disclosed information asymmetry and information costs. In such perspective, the information communicated through official website portals of marina operators constituting their attractiveness enabled me to classify this as research material.

For the electronic audit, I've designed a structured questionnaire with a set of 10 questions used to perform an audit of 43 selected marinas operator's websites. The data gathered in the electronic audit questionnaire, because of the unified content assessment methodology has enabled me to rank up marinas, identify gaps and distinguish the practices used. The electronic audit was deepened by an electronic survey designed and directly disseminated among managing teams of marina operators. The survey questionnaire consists of 17 questions, with the intention to assess the customer preference for the product attributes and determine the marketability of the product by the use of a Kano Model, a theory of customer satisfaction and a framework to analyze the importance of product attributes respectively which ones generate customer satisfaction. (Berger et. al 1993) An analysis of final results can be observed in the “Results” section of the thesis with the corresponding metrics in both versions (English and Croatian) in Appendix A. Through the use of a non-reactive electronic audit method, I focused both electronic audit and electronic questionnaire on assessing the current state of the environmental programs and gathered marina accurate information such as contact, services offered, size, amenities, ISO Management Systems, etc. The research sample selection consisted of 43 marinas in Croatia representing the entire entry market with web-context mining for identification and selection of marina operators for the sample. Web-context mining referred in this context to use the Internet search engine for research inquiry of "marina operators in Croatia," with results and site specifications gathered for further utilization in the study and business plan. Within the methodological design of my research, I used research design literature with a focus on environmental economics and regulation, sustainability, micro grids and smart grids networks, energy management systems and sustainable concepts in marina operations.

The literature review was conducted in three streams directly linked to the research questions and objectives. Consequently, a wide selection of recent studies and sources of policy information such as REN21 Reports 2015, 2016, 2017, IRENA, PWC Global Energy Utility reports, KPMG European Utility and power report, Global Trends, ECSIP, IEA/IRENA's Global Renewable Energy: Joint Policies and Measures Database and the OECD's IEA Energy Technology RD&D Statistics were used to assess the global trends and define the current economic context within domestic and European legislation.

In respect to the environmental management programs, the website audit assesses the current status of marina operators and afterward deepened by a further research in specialized recent niche literature in sustainable development concepts in Marinas and Nautical Ports. This first stream established the context and theoretical background bridging current trends with regulation-induced innovation, while the second focused on the latest technological developments and research on integrated technologies, in line with the findings of the previous stream. Also, the most recent technical subject matter literature and studies in the field of micro and smart grid disruptive technologies and integration concepts for cloud-based IoT Platforms that can foster smart grid tech and energy management systems reviewed. A careful selection of 16 white papers, workshops, conference and journals was purchased via a specialized academic service (IEEE) for the particular purpose of this dissertation due to the scarcity of recently published work on such a new research area. Also, the internal TU and WU database was used to find relevant knowledge in the subject matter as well as specialized platforms such as IEEE, REN, and IRENA.

Furthermore, addressing the third research question and objective the criteria to establish the viability of the business has been established through the results of the Kano model analysis and summary of the business plan elements such as marketability (market position analysis) and profitability. (Income Statement, Balance sheet, and cash-flow projections)

About particular research methods and techniques, my research took place in the following timeline:

- Conducted Opportunity, Market Gap, and Support Scheme Analysis – November 2016
- Conducted the international literature review – 1st of October 2016– 1st of January 2017,
- Performed the Electronic audit of official marina websites – 1st of January 2017 – 20th of February 2016 (43 electronic audits performed in total),
- Electronic survey with managing teams of marina operators– 1st of May 2017 – 1st of June 2017 (>14< surveys collected in total),
- My research methods and techniques, sample selection, and reasoning method have been presented in the figure below.

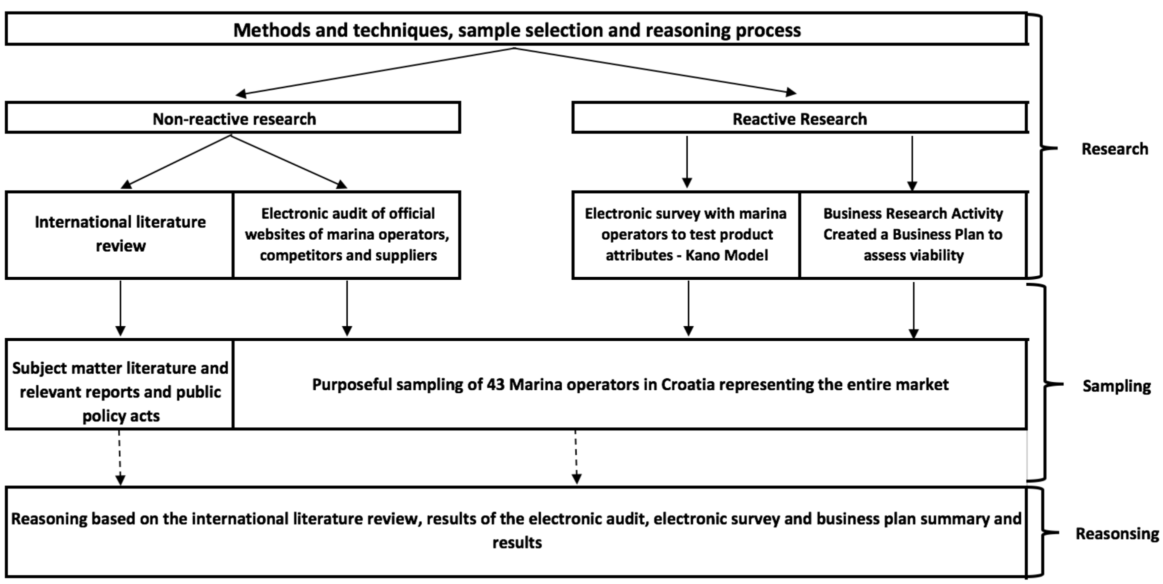


Figure 1: Graphic representation of methods, techniques, sample selection and reasoning (own elaboration)

1.4 Structure of the thesis

The structure of the thesis consists of 5 chapters. In the introduction, the problem formulation, objectives of the thesis, method overview and course of the investigation are presented. Chapter 2 provides a review of international literature CSR, Environmental Economics, Sustainable Concepts in Marinas and Ports as well define the concepts of smart grids and IoT Platforms.

Furthermore, in the same chapter, disruptive technologies and future developments are presented, as well as their implications for businesses and utility companies. Chapter 3 elaborates on the method used in empirical studies of micro and smart grid disruptive technologies and integration concepts for cloud-based IoT Platforms, including non-reactive, and reactive research methods, and also approach we used in gathering empirical material. In chapter 4 the results of empirical studies respectively answering the research questions based on the findings of Chapter 3 and conclusions of the business plan in Chapter 5. Lastly, Chapter 6 concludes the thesis and includes discussion over results of literature review, and empirical studies summarizes the thesis problems, and conclusion about its objectives.

2. Literature review

2.1 CSR, Sustainability and environmental economics

Corporate social responsibility, a concept whereby companies integrate social and environmental concerns in their business operations and their interactions with stakeholders on a voluntary basis consists of the obligations of the firm's obligations to stakeholders affected by corporate policies and practices. (Smith, 2010) Directly linked to CSR, sustainable development can be described as development meeting the needs of the present without compromising the ability of future generations to meet their own needs. (Brundtland, 1987; Gibson, 2012)

Starting with the 70's NGO's, policy makers and citizens have shown more awareness towards the adverse consequences of increased economic activity and resource demand. Establishing resources are finite, in their view, the consumption levels of the industrial world would become unsustainable thus encouraging the need to preserve natural resources. (Diederich and Althammer, 2016) The modern environmental movement was marked by the first Earth day in 1970, followed by the foundation of Greenpeace in 1971 and the Club of Rome preservations of the limits to growth in 1972. (Jaffe, Peterson, Portney and Stavins, 1995). These substantial changes led to a shared vision of economic activity which resulted in the foundation of environmental economics, a specialized, new field of research. (Mäler and Vincent, 2005).

The base theoretical framework bridging regulation and innovation finds its inception with Porter's hypothesis, which argues that the proponents of the conventional view have an incorrect assumption of the competition structure being static. In turn, ceteris paribus changes in environmental regulation result inevitably in cost changes with corresponding competitiveness effects despite the realist view of competition being a highly dynamic game. (Porter, 1991) As such, the competitive positions change frequently and re-determine constantly via entrepreneurial and innovative activities. (Fischer and Henkel, 2015) As a result, the regulatory stringency changes can lead to win-win situations for both firms and the environment with a key focus on regulation-induced innovations, neglected completely under the conventional view of a static assumption framework. (Porter, 1991; Porter and van der Linde, 1995)

One can state that the fundamental argument of the Porter Hypothesis is that well-crafted environmental regulation fosters innovations, which frequently leads to win-win situations where the regulated firm and the environment are left with a benefit. (Porter and van der Linde, 1995) Building on the theory, Beise and Rennings (2005) have extended the original lead market theory of Beise (2001, 2004) to environmental innovations and consider the particular role of regulation in this context. According to the authors, the leading markets for environmental services and goods are segmented and defined as countries, the first adopting a future global design standard to lead the international diffusion. In this context, green sector firms operating in these countries experience a classic first-mover advantage (Porter, 1990; Cash, 2007)

With a direct application on RES, technology-push policies, Bahar et al. (2013) make a clear distinction between three types of instruments. The first and most relevant for our arguments is the public support for R&D and Demonstration R&D&D of early stage renewable energy technologies with the governments pivotally sponsor public research or foster private sector corporate programs via grants, subsidies or tax credits such as member states of OECD. (Jaffe et. Al, 2005) Also emerging countries such as China have shown an increase of public R&D investments in RET from USD 2.5 bn in 1996 to USD 15.2 bn in 2008. (Cao and Groba, 2013)

Besides, the largest group of renewable energy support policies is market-pull measures which were meant to even out the disadvantage that RES have in comparison to conventional sources through the use of financial compensations for not emitting pollutants. (Gibson, 2012; Diederich and Althammer, 2016) Furthermore, market policies level the externality-related differences in the production cost leveraging renewable and conventional technologies. (Gibson, 2012; Diederich and Althammer, 2016)

Obtaining the ratification instruments, acceptance, approval, and accession from over 55 countries responsible for 55% global greenhouse gas (GHG) emissions, the agreement acted as a catalyst for RE Projects. (Diederich and Althammer, 2016)

2.2 Sustainable concept in Marinas and nautical ports

Over the past years, the extent and frequency of use for sailing and high-speed craft as part of recreational activities and touristic oriented services globally have shown a significant increase in a more growing demand for quality as a differentiator. (EOT, 2003; ECSIP Consortium, 2015) In turn, this has resulted in the inception of new marina developments which provide modern facilities, offer upgraded services to users, especially in countries like Croatia where tourism has become one of the most important economic activities. (ECSIP Consortium, 2015)

Recent studies have shown that the active promotion of marine tourism and coastal areas is highly recommended as each country has become more aware of the need to improve and protect these areas to preserve the environment towards its long-term vitality as a touristic destination. (Dragovic and Tselenis, 2015) Due to the essence of these leisure activities, pleasure, and recreation, wishing to discover the natural, cultural and social destination, tourists are seeking sustainable coastal regions, marinas and nautical ports (MNP's) (Lee and Yoo, 2014; Massiani and Rosato, 2008)

Strengthening these conclusions, general observations show a tendency in the tourism port sector towards the development of new marinas in areas with high touristic activity, of an intermediate size of 500-600 berths, as well as marinas in areas where competitive advantage already exists or on new off-grid potential locations. (Kamarinakis, 2000) Such demand has increased the need for additional activities on the coast based on the necessity of introducing and developing novel technologies and practices within the maintenance and operations of marinas which are meant to increase safety and protect the environment. (Tselenis, 2003)

Some of the recent studies dealing with marine tourism (Tselenis et al., 2014; Lee and Yoo, 2014; Raffaele 2014; Massiani and Rosato 2008) show that investing in a sustainable yachting industry can have a positive influence on the national economy, as it contributes to the creation of new jobs. (Dragovic, Skuric and Tselenis, 2015) A particular focus lies with preventing pollution resulted from the activities of the marina, and although most marinas offer similar services, the distinct differences consist of service quality, more precisely how environmentally friendly the marina activities are. (Tselentis, et al., 2015)

Although mooring, fuel, storage, water supply, craft maintenance, repair and waste disposal services are being offered at recreational ports, the ports that introduced environmental friendly policies and implemented regulations to increase environmental protection and safety are overwhelmingly preferred by most boaters. (Dragovic, Skuric and Tselenis, 2015)

With such demand, a framework for environmental management to include methodologies, practices, and regulations, and at the same time emphasizing the importance of further sustainable development has become a necessity for the industry at EU level. (Tselenis, 2008) Based on the European Sea Port Organization (ESPO), the most affected fields by marina activities which require management are quality of water, air, levels of dust and noise, loss of water and energy, waste and habitat loss (Woolridge et al., 1998)

Marinas in Croatia focus on implementing ISO 14001:2004 and ISO 9001:2008 with the first referring an environmental management and establishing the appropriate criteria with the second relating to quality management stating the framework that an organization can follow to set up an effective environmental management system. Some of the main benefits of using the ISO framework are a reduction of cost waste management and a lower distribution of costs. Furthermore, this entails a decrease of energy consumption and materials and enhancing the corporate image among regulators customers and public (Tselenis et al.,2014)

There are also important organizations such as the Blue Flag which aim towards sustainable development of the Marinas through establishing and imposing a rigorous criterion for the quality of water, information about the environment and education as well as the environmental management & safety. (FEE, 2013; FEE, 2017) The Blue Flag is owned and run by the non-governmental, non-profit organization the Foundation for Environmental Education FEE (Tselenis et al., 2014; FEE, 2013) with a primary objective is to reduce the costs and to have environmentally protected areas. The connection between the Blue Flag, ISO Standards, and Gold Anchor scheme is to provide all the environmental aspects of the marina's activities, using a consistent objective methodology to rank such elements into order significantly impact on the environment. (Skuric et al, 2015; SMP, 2014; FEE, 2013; FEE, 2017) Besides, such environmental management and monitoring for sustainable development in marinas had been the effective valuation tool for environmental amenities, (Dragovic and Tselentis, 2014) confirming that environmental attributes are valuable to estimate the actual demand for such attributes as competitive advantage among operators. (Dragovic et al., 2015) The introduction of a QMS in marinas is considered a good base to further facilitate the implementation of the EMS since the MNP's activities interconnect with sound management practices of activities concerning environmental standards. (Dragovic et al., 2015) The EMS for such marinas would be an upgrade to the existing management system, as it would contribute to a significant matter to further improving the management of overall organization through applying the ISO14000 framework. (Tselentis et al., 2015)

Building on the model in Fig 2, the entire procedure follows the steps as seen starting with the Blue Flag program and the intention to achieve standards for getting this award.

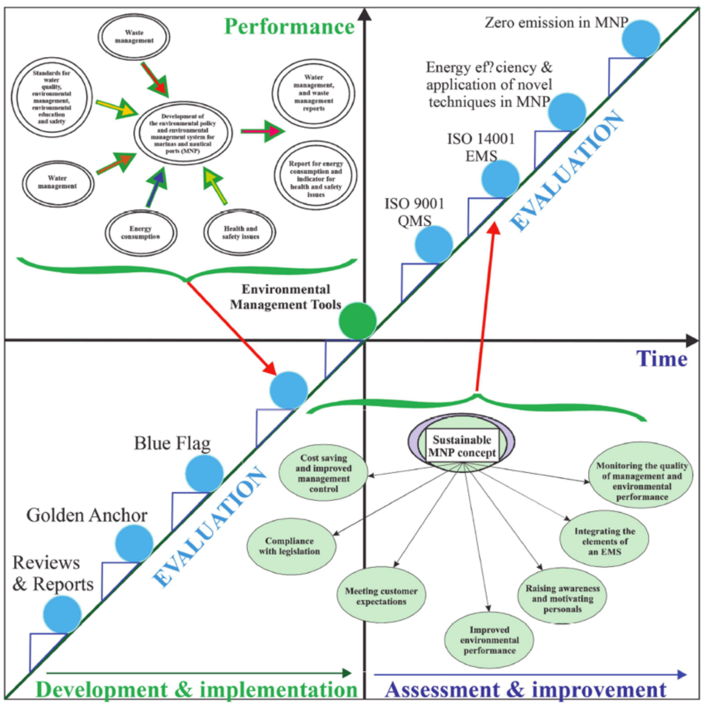


Figure. 2: The Marina Sustainable Development Model (MSDC) (adapted from ESPO, 2014; Tselentis et al., 2015)

Encompassing all the elements mentioned in the previous section, the Marina Sustainable Development Concept (MSDC) is innovative providing an opportunity for all responsible stakeholders to jointly perform a systematic analysis towards the protection of the environment in the marina. (Tselentis et al., 2015)

Primarily, the MSDC includes all the methodologies and environmental management tools in combination with training and advisory support services providing an option for the operators to develop and implement site-specific environmental programs in a time-scale of own choice at the same time voluntarily opting for professional review and certification. (Dragovic et al., 2014c; SMP, 2014) Such economic and environmental benefits from the programs are specified as along

with the certifications for ISO the procedure is initiated with the requirements of such standards (ISO) through a complete environmental review ultimately leading to an integrated management system. (Dragovic et al., 2015; Tselentis et al., 2015) Past ISO 14000 implementation, through the application of novel techniques in services and a life-cycle assessment for a Zero Emission marina, is based on identifying the characteristics and indicators that highlight vessel emission impact in the environmentally protected coastal area the operators can achieve the ultimate objective of a zero emission marina. (Dragovic et al., 2015; Tselentis et al. 2015)
The concept of zero emissions marina is consists of operations powered mainly by renewable energies to fulfill power requirements and reduce air emissions mainly using this concept for the emerging cold ironing regulation. (Dragovic et al., 2015; Tselentis et al., 2015) Following the concept is achieving a safe marina, evaluated by the prevention of incidental situations. With the successful implementation of the above, the MNP can introduce new facilities solutions in the high-level decision maker segment in assistance to a better understanding of the relation of operation to marina equipment and social context. Furthermore, this represents an instrument facilitating the marina planning directly into sustainable development planning and management. (Dragovic et al. 2014abc; SMO, 2014)

2.3 Disruptive technologies

At the same time, various technologies fitting the novel techniques of the MSDC model are rising with a significant impact on the future of the utility industry and current costs while carrying a considerable impact on traditional elements of power infrastructure. In the next section, we will explore such technologies and potential implications towards sustainable development. (IEA/IRENA, 2015; KPMG 2016; KMPG 2017; PWC, 2017)

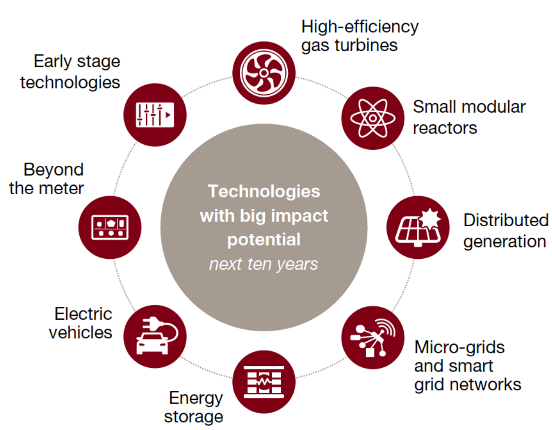


Figure. 3: Technologies with big impact potential next 10 years (PWC, 2016)

Some of the technologies with big impact potential can be observed in figure 3 with several such as beyond the meter, electric vehicles, energy storage, micro grids and smart grid networks, as well as distributed generation, can help achieve the Zero Emission MSDC.(KPMG, 2016; KPMG,2017)

2.4 Nano-grids, Micro-grids and Smart-grid networks

After decades of limited grid technology, evolution and investment focused on expanding access, the emergence of smart meters in the 2000s helped utilities establish a foundation for an intelligent and resilient grid to manage energy flows. With over 600 million smart meters deployed worldwide with an additional 180 million expected in the next five years, mostly in Asia-Pacific, yet this is far from global saturation. (KPMG; PWC,2016; PWC, 2017)

A review of recent studies and reports show new grid investments to focus on: distribution automation, transmission modernization, network operations software and grid analytics. With over US$400bn expected in grid modernization by 2020 this brings the total global smart grid investment on a steady and significant upward trajectory (KPMG; PWC,2016; PWC, 2017). Since the technology for smarter, more resilient grid management improves, it will also enable the development of more self-contained MG's. (IRENA, 2015; KPMG, 2016; PWC, 2017)

MG's and SG networks integrating renewable energy sources can connect directly to the grid using a grid-tied inverter or they can be combined with local loads to form an independent power system. (Hagh and Aghdam, 2017; Teleke et al., 2017)

Nano grid

Nano-grids are considered the building cells of micro grids, (Teleke et al., 2017) and represent a small power system using a combination of renewable and non-renewable energy source for the supply of power to small local loads. They are efficient, reliable, self-sufficient and fault tolerant with a load conventionally less than 20kw representing a home, small rural community or industrial site. The power generators comprise of clean energy forms: fuel cells, solar arrays, and wind turbines. (Teleke et al., 2017) Consequently, a nan grid employs several power electronic converters (DC/AC or DC/DC) which are used as an interphase to the generators and the loads to the grid as well as linking the NG to the power system. (Hagh and Aghdam, 2017; Teleke et al., 2017) The typical structure of an NG consists of a solar PV system as the sources of energy, energy storage, power electronics converters, NG controllers and residential or commercial load and can fully integrate in a micro-grid as per the architecture in the figure below:

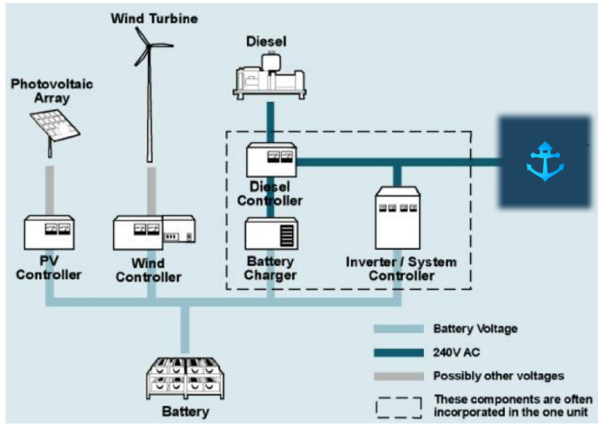


Figure 4: Standard Architecture of a Nano Grid (Adapted from Teleke et al., 2017)

In turn, the controller communicates with the converters, loads, and grid and consists of advanced electronics balancing generation and load within, perform load shedding and through the coordination of energy transactions between the NG and grid further being able to act as a data acquisition unit. (Hagh and Aghdam, 2017; Teleke et al., 2017) The unit then collects and records data from and to the grid, as well as from the converters and smart appliances. (Chung, 2013; Hong and Chen, 2014) Some advanced controllers that can communicate with the grid operator and receive price signals are still currently under development. (Lo and Woo, 2017; Yazdanian and Mehrizi, 2014) Concerning the energy storage component of an NG, this can be battery based such as Lead Acid or Li-Ion which are widely available. The converter for energy storage can be a single bi-directional DC/AC converter, or a two stage converter consisting of a bidirectional DC/DC converter to boost the DC voltage and a bi-directional DC/AC converter to interface with the AC NG. (Teleke et al., 2017) The energy storage component provides multiple benefits which will be covered in the following sections.

Micro grids

Larger than an NG, a micro grid (MG) is comprised of a semi-autonomous collection of distributed generators and controllable loads that act together do supply reliable and secure electric power and heating to a local community. (Abd El. Rahim et al., 2017; Ahshan et al., 2017)

MG's are particularly appealing to customers having large, critical load or concentrated infrastructure with specific needs not entirely met by the current grid such as enhanced reliability, service in remote locations or increased use of renewable energy. (Abd El. Rahim et al., 2017;

Ashan et al., 2017) Worldwide, the MG market is expected to reach US$8.4bn by 2020 and US$12bn by 2030, showcasing 40% of capacity in commercial and industrial locations while 40% in military or remote area applications. (Abd El. Rahim et al., 2017; Ashan et al., 2017) Despite current favorable legislation, growth potential depends heavily on costs as customers have become more willing to pay the premium for reliability. At the same time, the growth forecast does not pose an immediate disruptive threat to utility business models. (Abd El. Rahim et al., 2017; Ahshan et al., 2017) Built on NG's, in concept, a design for an MG also includes several key functional components comprised in turn of some different technologies and operational processes. The components are the energy supply system (PV arrays and WT), energy storage capacity, DE and efficiency measures, energy management systems and utility grid interconnection. (Microgrid Institute, 2013)

Smart Grids

Innovating the future of electrical network through the replacement of an existing electrical power grid, the Smart Grid can be defined by several characteristics. Among them are such as being user-friendly, self-healing, attack resistant, able to accommodate all types of generation units and storage elements as well as high power quality and efficient operation through the involvement the electricity markets in the energy industry. (Auer and Heng, 2016; Hagh and Aghdam, 2017) These characteristics enable the smart grid to be an efficient power system entailing high renewable generation, reliability, and sustainability. (Lo and Woo, 2017) By doing so, it facilitates delivering the electricity to the consumers via a two-way communication with user preferences (Lo and Woo, 2017)

2.5 Implications for utilities

Potentially becoming beneficial to utilities, through capacity investment speed reduction for peak demand, MG's represent a long-term threat to utility companies if they can become competitive as it decreases the customer reliance on traditional energy sources. (IRENA 2015; KPMG 2016, PWC, 2017) Continuous adoption can present an opportunity for utilities as they can become a micro-grid developer for customers both inside and outside of the service territory hence playing a marketplace role. (IRENA, 2015; KPMG, 2016; PWC, 2017) Recent reports show that whole physical operation and maintenance activities are minimized; the key function has become the integration and coordination of electricity supply and demand across dozens of micro grids. (IRENA 2015; KPMG 2016; PWC, 2017) As utilities need to monitor the scale and timing of micro-grid expansion as well as jump-starting deployments being pushed by a severe event or government-driven mandate this will be a niche market greatly suited for utility participation but not being a robust disintermediate threat to the current network. (IRENA 2015; KPMG, 2016; PWC, 2017) The absence of common standards for integration required hardware and software has been a barrier to customer adoption even with the OpendADR Alliance which standardized many demand response elements. However, there are also other controls operating under different data standards with an elaborate architecture composing of hundreds of systems entailing a complexity in implementing monitoring and coordination logical systems in a multifaceted micro-grid. (IRENA 2015; KPMG 2016; PWC, 2017)

2.6 Implication for businesses

Concerning the commercial application, the trends in the prior section are driving an increased number of providers into developing energy services for commercial and industrial customers that aim at integrating the onsite power such as renewables and storage, demand management and energy efficiency retrofits and current supply with a set of predictive monitoring and control features. (IRENA 2015; KPMG 2016; PWC, 2017) Complex software must surpass existing offerings of energy reporting dashboards or less scalable consulting models to ensure success. Also, this would require a seamless integration of multiple technologies using multiples software layers to enable automation and decision making flexible to match a variety of environments. (IRENA 2015; KPMG 2016; PWC, 2017)

2.7 Early-stage technologies, future scenarios and development

In the context of early stage technologies, mainly focusing on generation and grid, one can observe from figure 6 below that the comprised technologies are within the 5 to 10-year range.

Regarding generation, introducing new solar technologies such as nerovsktenbased solar cell have the potential to overpass the current silicon PV efficiency with the final achievement of the thin-film solar with the possibility of print on flexible substrates enabling building-integrated photovoltaics. (BIPV) (IRENA 2015; KPMG 2016; PWC, 2017)

Concerning the grid, there is an increase in focus to improving the reliability and resilience of the electric grid which will drive the development of new power system models such as open-access which will use advanced algorithms in optimizing and controlling the distribution and transmission. (IRENA 2015; KPMG 2016; PWC, 2017) At the same time, industrial scale flow batteries used to store energy in liquid form and fast recharge while retaining the charges for a longer period are expected to gain a consistent share of the market as lithium Ion technology entails increased costs. (IRENA 2015; KPMG 2016; PWC, 2017) Wireless beyond the meter power charging comes with a high potential increasing the rates of adoption for battery-powered devices to include vehicles, a critical factor in reversing electricity demand deterioration. Intelligent thinking systems optimizing energy device performance, consumption and prosumer actions such as Energy Hubs will consist of real-time active and integrated knowledge tools for premises and facilities. The improvement of consumption profiles will entail a development and proliferation of interconnected devised to allow applications such as fully automated demand response and energy management. (IRENA 2015; KPMG 2016; PWC, 2017) Such devices will stretch the boundaries behind the meter by creating new communication layers for utilities. (Joshi et al., 2016)

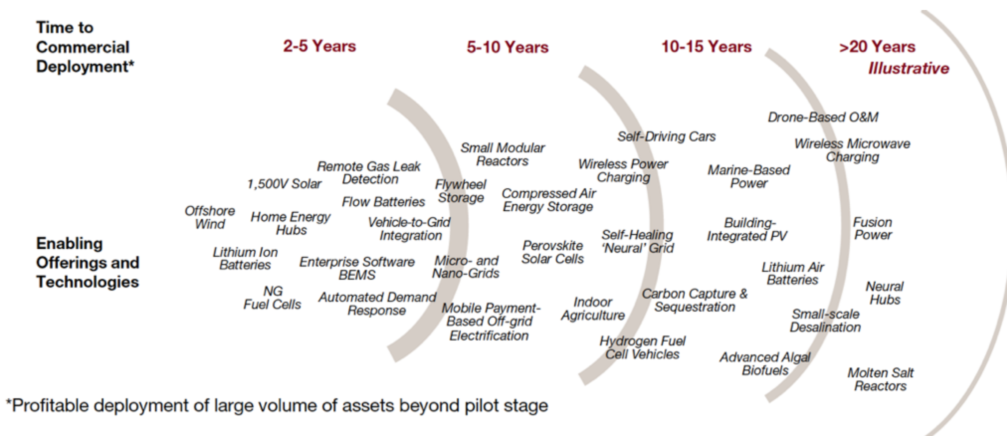


Figure 5: Early Stage Technology Development Funnel (PWC, 2016)

Within the forecasted scenarios in regards to disruptive technologies, most recent studies foresee a future in which utility companies lose touch with the customer with other players taking control of the client's energy hub performing all routine and value-added functions for the consumer. (IRENA 2015; KPMG 2016; PWC, 2017) The focus shifts away from the main grid towards onsite generation and storage as well as DG via micro-grids which will become more of a source of backup power as utilities must solve the maintenance of underused costly energy infrastructure. (IRENA 2015; KPMG 2016; PWC, 2017) With electric vehicles developing at a fast pace, it will create the need for substantial infrastructure investment along with the opportunity to be used as mass storage devices putting a lot of pressure on local utility networks and circuits which will face considerable competition from a range of other players such as solution integrators. (IRENA 2015;

KPMG 2016; PWC, 2017) Intelligent, ubiquitous sensors that collect energy flows and performance data from all network levels and regulators will shift the value away from traditional utilities towards offering knowledge-based value added energy management services to customers. (IRENA 2015; KPMG 2016; PWC, 2017) At the same time, business customers will begin to consider the installment of self-decentralized and scalable generation for own usage. With the rapid pace of technology, the size of the commercial and industrial customer will increase and shift toward site-based generation, as traditional utilities face a decreasing role no being able to avoid disintermediation with large clients. (IRENA 2015; KPMG 2016; PWC, 2017)

	'Losing Touch'	'Off Grid'	'Mobile and Virtual'	'Data Rich'	'Scaled Down'
Relevant Time-Frame	2022 →	2018 →	2022 →	2020 →	2023 →
Regulatory Impetus	• Customer choice	• Customer choice • Open standards	Open standards	• Open access • Data priority	• Open access
Technologies					
Competitor Types	• Telcos • OEMs • Technologists	• OEMs • Specialist contractors • Municipalities	• OEMs • Municipalities	• Data managers • Software analysts	• OEMs
Competitor Enhancers	• Technology • Solutions as a service • Partnering • Applications	• Technology • Partnering	• Applications • Selections as a service	• Software • Partnering	• Partnering • Technology

Table 1: Most likely scenarios for future developments (PWC, 2016)

2.8 Future developments

Concerning future developments, the future of the energy grid will showcase big data analytical capabilities enabling the processing of simultaneous significant amounts of information focusing on primary sensory inputs. (IRENA 2015; KPMG 2016; PWC, 2017) As previously mentioned, there are still standardization challenges in the management and linkage of data from different systems while implementing the data layer on top of the physical layer. (IRENA 2015; KPMG 2016; PWC, 2017)

Looking at recent reports from the traditional OEM's such as ABB, GE, Siemens and Schneider Electric one can observe the development and acquisition of software technologies to bring these analytical capabilities to their hardware. (IRENA 2015; KPMG 2016, PWC, 2017) At the same time, some of the top solution companies such as Honeywell and Toshiba are expanding hardware solutions towards soft-based end-to-end data management solution for utilities. Moreover, big data start-ups such as, as C3 Energy, Space-Time Insight, Bit Stew Systems, and Focus Energy are levering the software analytics into driving intelligent decision making using data cross utility operations. (IRENA 2015; KPMG 2016; PWC, 2017)

Regarding metering, one can observe that only cost management was not sufficient to spearhead demand for services with commercial and industrial customers becoming more interested in choice, control, comfort, convenience and collaboration and are developing the need for smart facilities to integrate energy controls with other site functions in their operations. (IRENA 2015; KPMG 2016; PWC, 2017)

Addressing their needs, a wide array of technologies supporting energy monitoring, measurement, visualization, and control emerged offering the desired functionality in particular Advance Metering Infrastructure (AMI) deployment and national-level reporting standards have broadened the customers view and understanding of energy consumption. (IRENA 2015; KPMG, 2016; PWC, 2017) For example, load disaggregation technologies provided by companies such as Bidgely, Opower, and PlotWatt are making it easy to understand base and appliance load optimizing energy consumption via dedicated displays for energy monitoring replaced by software applications, big-data processing, and data visualization technologies. Also, the demand for better energy management made available several low-cost technologies. In 2015, 240 energy management products were available in the US alone spanning over 12 different categories such as smart-lightning to energy portals, analytic platforms, and displays. (IRENA 2015; KPMG 2016; PWC, 2017) In-home displays and online energy dashboards consisted for 34% of overall products (IRENA 2015; KPMG 2016; PWC, 2017)

Multiple products in the market today surpass just the display of energy consumption and information by providing analytical, intelligent information based on history, preference, and integration with other statistical data. (KPMG; PWC,2016; 2017)

One can observe an increase in the range of products on the market that surpass the display of energy consumption information and provide analytics, information intelligence that is based on integrating the history and consumer preference. (IRENA 2015; KPMG 2016; PWC, 2017) Such devices like energy monitor have begun proliferating throughout the sites and substantially affecting customer engagement and consumer patterns while at the same time entail increasing communication and computing capabilities by building repositories with valuable data, thus creating “energy hubs” (IRENA 2015; KPMG 2016, PWC, 2017)

The bigger picture portrays a shifting future focus from individual energy devices and analytics towards the total integration and mastering the operating system of all internet of things (IOT) devices inside the industrial, commercial site or residence. (IRENA 2015; KPMG 2016, PWC, 2017) A great marketplace example of such interest is Google acquiring Dropcam and Nest after the shutdown of their Power Meter program. Another example is Amazon's Echo that aims at becoming a hub to connected, devices, people and the network via a voice interface, currently connecting with a wide array of energy devices such as smart plugs, Philips Hue light bulbs and surprisingly even competitor products (Google Nest thermostat).

2.9 (IoT) and (CPS) technologies

Cyber-physical systems technologies (CPS) and Internet of things (IOT) have a wide range of application domains such as intelligent greenhouse, intelligent transportation system, power distribution grid smart home, smart building, and smart city. (Calvo et al., 2012; Shih et al., 2016) Recent studies show that efficiently designed IOT/CPS will reduce the consumption of energy, increase safety in building and cities as well as the conformability of the site. (Shih et al., 2016) Additionally, over the past years, the industrial partners and financial communities begun studying and investigating the smart building and smart city scenarios and have developed prototypes and commercial services. (Shih et al., 2016)

A large number of market survey reports such as CISCO and IDC show an estimation of the number of IoT devices will surpass the number of populations in the world within the next few years. Today's necessity is to manage 3 to 7 digital devices while the total number of network-connected devices will reach to 50 billion in 2020. (Shih et al., 2016)

Among some of the prototypes mentioned, facilitating the deployment of IoT-based grids in internal environment models such (Tanyingyong et al., 2017) are small scale programmable and being able to adopt DC-DC converters while accommodating the small-scale DC power systems such as PV Array or small wind turbine. As observed in the multiple proposed architectures (Tanyingyong et al., 2017) the core design has bend designed based on a distributed control unit integrating embedded IoT technology and utilizing IoT protocols to enable SG functions. (Shih et al., 2016; Tanyingyong et al., 2017) The added intelligence such as two-way communication, sensing, and advanced control capabilities is what makes a grid smart, allowing not just to detect and react to changes in an autonomous and timely matter but maintaining a high level of reliability, efficiency and service quality in the process. It's because of these capabilities, the IOT is seen as the key technology enabling the transformation process to an SG from a traditional grid. (Shih et al., 2016; Tanyingyong et al., 2017)

As discussed in the previous sections, the standard approach for small business owners to build a small scale SG is to integrate DE sources such as energy storage and power generators with low voltage electrical systems to serve local users; a term often referred to a MG.

2.10 Micro grid drivers and enabling factors

There are several factors to drive the increase in interest for MG solutions. The first lies with energy assurance as there is a need for a sustainable, stable energy supply at critical sites for safety and public services such as a wide-scale outage or natural disasters. (IRENA 2015; KPMG 2016; PWC, 2017) Next, reliability as there is a need for increased security and resilience at priority commercial, industrial and military sites where an outage will cause disruption risks and financial loss. (IRENA 2015; KPMG 2016; PWC 2017) Another factor is clean energy development as there are increased public policy goals to increase RES, reduce greenhouse gas (GHG) emissions, improve system efficiencies and general environmental effects of energy services. Looking at economic development, it is imperative to encourage and facilitate economic development by the attraction of new businesses and advance technological capabilities, in turn, creating jobs. (IRENA 2015; KPMG 2016; PWC, 2017) Furthermore, disruptive technologies and forces enabled by transformative industry trends have made DG, energy management tech and storage more useful and profitable via an array of applications challenging the traditional business model for utilities. Lastly, local self-reliance we can observe customers increased interest in alternative service models, particularly the ones enhancing autonomy locally, economic health and environmental quality. (IRENA 2015; KPMG 2016; PWC, 2017)

2.11 Demand Response and Efficiency

Such MG designs foster DR conservation along with efficiency measures leading to minimizing energy usage as well as reducing the non-critical load at times when operating in island mode, off-grid. (Calvo et al., 2012; Shih et al., 2016) As such, DSM measures can reduce the total capacity supporting ensuring stable operation. The generation capacity is the most expensive part of the system, consequentially the economic use of DSM measures allows micro grid asset mix optimization as well as reducing capital and operating costs. (Calvo et al., 2012; Shih et al, 2016) Additionally, they can help maximize the exploitation of non-dispatched variable energy sources (wind; solar) and reduce utility power purchases and fuel costs. Furthermore, the DR capacity supporting the load reduction and shifting allows the MG operator to sell DR capacity on wholesale markets, thus generating sales revenue. (Calvo et al., 2012; Shih et al., 2016)

Mechanical Energy Storage such as flywheels are considerable and tested their feasibility in the MG's through the past years. Among the several, most current energy storage systems are Flywheel Energy Storage Systems, Battery Energy Storage Systems, ultra-capacitors, and super capacitors, Vanadium Redox Batteries, Superconducting Magnetic Energy Storage and Hybrid Energy Storage Systems. (KPMG; PWC, 2016; PWC, 2017)

Overall, the development of renewable energy in conjunction with Distributed Generation (DG) systems has meant that its use has been oriented from large companies to private consumers. This has caused that many homeowners and communities in residential areas have implemented their sources of distributed generation as an alternative or reinforcement to conventional electrical supply utilities. (Calvo et al., 2012; Shih et al., 2016)

3. Method

According to Yin (2003), there are three research purposes: exploratory, descriptive, and explanatory. As such, an exploratory study covers a whole new area of research and does not follow directly from the current study. Research studies are conducted best used when there is no clear theory evidence, the research problem not being defined, with the characteristics and relationships being difficult to determine. (Eriksson, Wiedersheim-Paul, 1997).

Based on the above the most appropriate method to answer the research question is though descriptive study since its focus relies on a particular situation and trying to determine the mutual relationships between them. Eriksson and Wiedersheim-Paul (1997), argue that the best case is marked by a lack of interconnections in between symptoms and causes, thus the research problem is clearly defined and structured. The purpose of the descriptive study is precisely finding the linkage between such symptoms and causes. (Eriksson, Wiedersheim-Paul, 1997) Furthermore, this purpose can be utilized in situations where the author focuses on the reasons of the behavior/situation to detect causes and effects. (Yin, 1994)

The following sections will elaborate on the method overview in terms empirical investigation approach, evidence data gathered with the results presented and analyzed through a systematic analysis to answer our research question in Section 4 of the thesis.

3.1 Empirical investigation approach and evidence data gathered

There are two different approaches to research, quantitative and qualitative. (Holme and Solvang, 1997) Quantitative research means analyzing a problem by collecting information and data. The purpose of the qualitative method is to show the researcher's perception and interpretation of the situation (Holme and Solvang, 1997). As so, for the purpose of the reasoning the first two question will be addressed by qualitative measures through a systematic literature and case analysis. With the survey and business plan requiring clear and specific objectives as the basis for data gathering procedures, data will be collected; the author chose to conduct a survey method because survey method answers most appropriately elements of the research questions the most. Addressing the third research question, the method of choice will be quantitative as it involved assessing the product features through the use of a survey. The results are interpreted via a Kano model as well as the results of the business plan concerning the profitability and cash-flow of the venture respectively the investigation approach entailed quantitative means that are measurable.

3.2 Data collection method, sample collection and data analysis

There are six different sources of information for collecting the data: as documentation, archival records, interviews, direct observations, participant observations, and physical artifacts. (Yin, 1994) In this research, I have collected participant's marina operators' views through the survey. Survey software Survey Monkey is used for collecting survey data via Survey Monkey online link. For all marina operators in Croatia, 43 of them, the survey in Croatian was sent on their official listed business emails. The author structures the questionnaire to most adequately address the research question and by gathering accurate data. Direct or indirect to the targeted audience are two options depending on the purpose of the study (Malhotra, 2010; Oghazi et al.,2012). A direct census-type approach enabled me to collect the data from all marina operators in Croatia. The survey in the Croatian language was sent to the email addresses all licensed marina operators in Croatia in a sample of all-together 43 management representatives with the data collected via MonkeySurvey.com link. More precisely, the survey questions were written in a way to rank the product attributes and assess their importance for the target market. The idea for the questionnaires was gained by the literature review on the topic of sustainable development in MNP's, and it was designed to meet some of the research objectives by obtaining the customer perspective on the right product attributes of the concept.

4. Results

4.1 Results from quantitative research

Customer listening is crucial to identify and understand the needs, priorities and constraints of the client. Based on such knowledge, the offer is often tailored and adapted to meet client expectations (Saxe and Weitz, 1982) in turn, creating a relationship based on dialogue and understanding. It is important to understand that customer perception on how well the vendor attempt to meet his needs and listen to his demands influences interest and confidence in the company, product, and sales process creating a positive relationship between the two (Tracy, 1995; Ramsey and Sohi, 1997). Customer listening brings a strong contribution to establish and build trust with their clients (Akrout, 2010), and its seen as a critical element in successful negotiation-selling. (Moore, Eckrich and Carlson, 1986) Often ensuring the success of a sale, it's absence is most certainly represents a primary explanation for the failure of the respective sale. (Ingram, Schwepker and Hutson. 1992).
To understand our customers first, we needed to identify them and establish contact. By assessing the sites of marina operators, we were able to gather valuable primary data about our target market and determine our customer profile. As observed in the table compiled in Appendix F, first contact details, addresses, emails, and websites were collected and organized. Furthermore, each location was assessed based on the number of berths both wet (ranges from 50 to 1200) and dry (from 15 to 400), mega yacht docking capabilities (vary from 20m to 140m) as well as available amenities. Among most common amenities the audit found the following: Bureau de change, ATM, Wi-Fi, fuel station, restaurants, bars, cafes, nautical equipment and clothing store, boating and spare parts store, grocery store, spa and beauty salon, launderette, boat maintenance, and repair shop and fishing gear store. A full ranking of the marinas and a complete breakdown of the site audit and specific marina details can be observed in Appendix F.

Also, by further analyzing the survey results in Appendix B, we can find a percentage of 14,29% answering "Yes" the the first question, respectively 85,71% answered "No" concerning the current state of integration of RES in their operation. Furthermore, the only installation present based on the survey is a <10kw Solar plant as per answers to Q2. Assessing the future consideration of integrating RES in the future, 92,86% of the respondents answered "Yes" respectively 7,14% answered "No."

Concerning the functional questions Q4 onwards, 12 respondents answered: "I like it" with an 85,71% while the remaining two answered, "its implied" with a percentage of 14,29%. For Q5, concerning the Energy cast platform allowing optimal utility consumption and enhanced energy management and control, 71,43% of the respondents answered "I Like it" while the remaining 28,57% considered this to be an implied product feature. When asked how would they rate a feature enabling them to expand and establish marina operation to remote locations without needing to connect to the grid (Q6), 42,86% responded "I like it," 35,71% answered its implied, with the remainder of 21,43% remaining indecisive. Furthermore, concerning the customer's assessment of a centralized marina management system through an all-in-one dashboard (Q7), 35,71% of the respondents answered "I like it," 50% considered it to be an implied feature, while 14,29% were indecisive. In respect to fostering a data hub, cloud and a digital eco-system including analytics and consumer data (Q8), 35,71% showed an active choice of liking it, 42,86% believed it's implied, while the remaining 21,43% were indecisive. When asked about direct client communication via the App and integrated business services (Q9), 50% of respondents answered "I Like it," 28,57% believed it to be an implied feature, while 21,43% remained undecided.

Analyzing the dysfunctional section, one can observe a 92,31% response rate in the case of not providing an added capacity of 60kw from RES respectively 7,69% responded it's implied in Q10. When asked not having the ability to consider and expansion to off-grid locations for Q11, survey takers answered "I don't like it" with a percentage of 69,32%, indecisive with 15,38% respectively "its implied" 15,38%. In respect to not having an option of utility consumption optimization via energy management tools, the vast majority of respondents were indecisive in a percentage of 58,33% while, 25% "did not like" it with a remainder of 16,67% responding it's implied. Furthermore, concerning the lack of centralization of the marina system, the majority of respondents were indecisive with a percentage of 61,54%, 15,38% did not like it while 23,08% answered: "it's implied."

Also, the lack of a data hub and digital system triggered a reaction of indecision between 69,23% respondents respectively, 23,08% of them "not liking it" with the remaining of 7,69% answered, "it's implied." Furthermore, the unavailability of direct client communication via the app and integrated services resulted in a response of 53,85% "not liking it," 38,46% being undecided and 7,69% remaining undecided. Lastly, concerning the live feeds via app involving berth charging, marina sensor grid, ultrasound, meteorological, water quality and wave measurement the majority 61,54% of respondents answered "they would not like this" with the remainders 38,46% undecided. Using the survey results both contributions to satisfaction and dissatisfaction were calculated using the Berger et al. (1993) adapted model in Appendix D with the following results presented in fig 6 below:

Feature 1	Added power capacity of 60kW from renewable energy sources
Feature 2	Optimal utility consumption and enhanced energy management and control
Feature 3	Ability to expand/establish marina operations on off-grid remote locations (islets).
Feature 4	Centralized marina management system and all-in-one control dashboard
Feature 5	Data hub, cloud and digital ecosystem (IOT) to include analytics of system and consumer data
Feature 6	Direct client communication via App
Feature 7	Integrated feeds via APP.

Table 2: Smart Marina Product Features (own elaboration)

The results of the Kano model describe 2/7 product features listed in Table 2 in the excitement quadrant implicitly RES power generation and the digital ecosystem while the other four are directly perceived a performance attributes with and overall 85% of attributes in the higher quadrants with overwhelming response percentages. Only Feature 4, a centralized control dashboard was observed as a basic attribute in the overall description of the solution. In addition to the above, the proliferations of RES in marina operators of the selected sample was extremely small to only on <10kw system identified. Although experiencing a little presence in MNP operations, there is a significant percentage (92,865%) of marina operators that would consider introducing RES into their operation in the future.

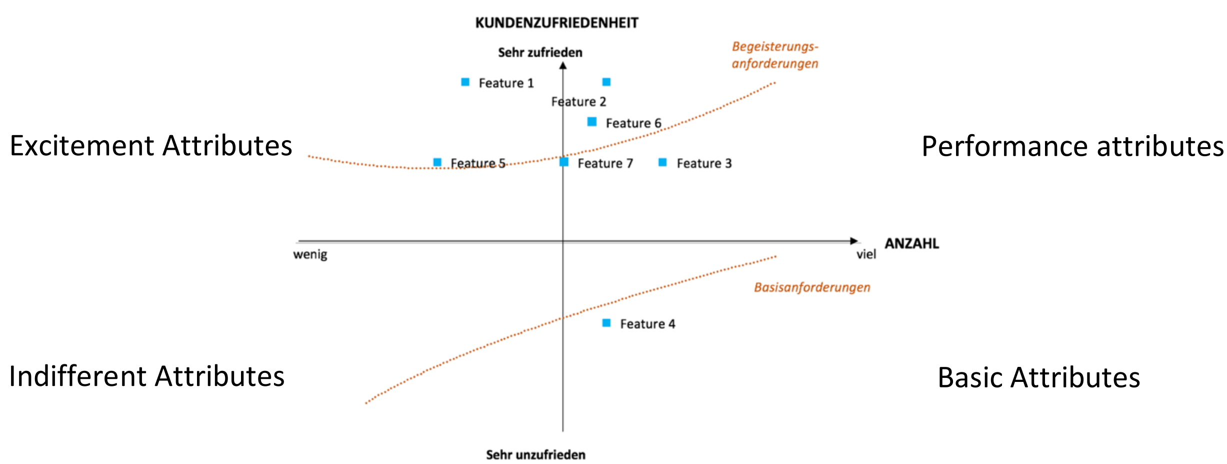


fig. 6: Kano Model Results for Product Features 1-7 (own elaboration)

4.2 Results from qualitative research and answers to research questions

4.2.1 Research Question One

A systematic analysis of data in Chapter 2 of the thesis-related theoretical background, provides a deeper look into the field of environmental economics, more precisely building on variations and implications of Porter's (1991) hypotheses. The fundamental argument is that well-crafted environmental regulation will foster innovations leading to win-win situations for both firm and environment. Building on this evidence, Beise and Rennings, (2005) worked to extend the original lead market theory concerning environmental innovations by defining and segmenting the leading markets for environmental services and goods to be segmented as countries, adopting a future global design standard. Based on this argumentation, green sector firms operating in such countries, experience a classic first-mover advantage as described by Porter. At the same time, following the Paris Agreement in 2015, over 55 countries responsible for the 55% global greenhouse emissions have obtained ratification instruments, acceptance, approval and accession. (Diederich and Althammer, 2016) Furthermore, in 2015 the Sustainable Development Goals on Sustainable Energy of All (SDG 7) was adopted by the UN General Assembly with the G20 and G7 groups commitment to accelerating programs on energy efficiency and renewable energy. Respectively this entailed developments of the policy landscape to include electricity, heating and cooling, transportation, and city and local government initiatives showing and understanding of the benefits of RE as a source to meet off-grid and distributed demand. (Diederich and Althammer, 2016) Since 2014 there has been a significant ambitious increase of renewable targets and policies at country level (more than 170 countries have renewable energy targets, and an estimated 150 countries have policies that support RE) with a growing number setting targets at 100% including the Republic of Croatia our entry market. (IRENA, 2015; KPMG, 2016; PWC, 2017)

Analyzing market conditions in Croatia in the context of particular environmental regulation, one must have a look at the electricity market and recent changes first. Following its 2008 liberalization, the market opened to companies such as RWE and GEN-I, and as required by the Electricity Market Act, the HEP Group unbundles the transmission system to the generation business. Enforced regulations enabled the average electricity price at 0.132 Euro per kWh for households and 0.092 Euro per kWh for industries. (Eurostat, 2015) Most, generated power (60%) comes from hydropower, 18% from coal and gas with 15%, and wind at 4%. Biomass is quite small at 1% with solar PV much lower at .1% (IEA, 2014) Croatia accepted the commitment to apply the European Directives for RES such as EU Directive 2009/28/EC which set the target for RES to 20% by 2020. The combined install capacity for solar and wind is at a total of 90MW. Respectively, Croatia's National Action Plan for RES (NREAP) adopted in October 2013 also defined the RES target shares as 39% of electricity consumption, 10% for transportation and 19,6% for cooling and heating. (ME Croatia, 2013). According to the NREAP, the normal distribution between RES technologies regarding wind and solar is 10.5%, respectively .9% a significant increase from previous targets.

Concerning renewable energy support policies and frameworks, the largest category is represented by market pull measures which "even out the playfield" for RES in comparison with conventional sources through the use of compensations for not emitting pollutants. In the case of Croatia, the legislative framework for the development and support of RES power generation consists of an incentive system which includes a mandatory power offtake and a feed-in tariff differentiated by technology and installation size. Currently, for a 30kw solar installation, the feed-in tariff is 1.87 Kuna/kwh however, wind is subject to a reference price calculated on a daily basis (RES Legal Europe, 2014) with support contract valid for 14 years.

Analyzing the current national situation in Croatia regarding the technology push policies and instruments such as public support for R&D and Demonstration R&D&D of early stage renewable energy technologies, one can observe a crucial support for private sector programs via grants, subsidies and tax credits. Among the support schemes, we can find HBOR loans, which are issued for the employment of RES-E technologies as part of "environmental protection" loan scheme by the Croatian Bank for Reconstruction and Development (HBOR) in cooperation with the Environmental Fund and business banks. Together they finance 75% of the investment at a variable interest rate of Euribor +2%/yr. Another support scheme is provided by the Fund for Environmental Protection and Energy Efficiency and comprises of interest-free loans for the promotion of renewable energy sources following a tender process. Furthermore, privileged producers owing RES installation not exceeding 30kw can conclude a power selling contract at a guaranteed purchase price past a public tender carried out by the Croatian Energy Market Operator.

By observing the correlations between the theoretical background and empirical evidence concerning country characteristics, one could state that the current environment in Croatia fosters innovation regarding RES but also provides a significant opportunity for firms to experience a sustained first mover advantage on the market.

At the same time by analyzing the latest sustainable concepts in MNP's quality emerged as the growth differentiator which triggered new marina developments with an enhanced focus on environmental protection and sustainability. Secondly, the case studies analysis show that most boaters overwhelmingly prefer environmentally friendly policies and implementing regulations to increase environmental Protection.

Addressing the two drivers' marinas are implementing the ISO 14000 and ISO 9001 standards, first relating to environmental management and second to quality management which provides a good base to implement the EMS since the MNP's activities are interconnected. The introduction of such system is considered an upgrade. Furthermore, the analysis shows that environmental management and monitoring for sustainable development represents the primary valuation tool due to the connection between the Blue Flag, ISO Standards and Gold Anchor Scheme's scientific methodology explicitly confirming that environmental attributes are valuable to estimate the actual demand for such attributes as a competitive advantage among operators. The latest theoretical framework is the Marina Sustainable Development model which includes all the methodologies and environmental management tools for operators to develop site-specific programs via the ISO procedures. After the ISO 14000 implementation, the next-to-last phase of the model has comprised of Energy consumption and application of novel techniques as well as a life-cycle assessment for a zero emission marina, the ultimate objective of the model. By representing and instrument facilitating marina planning directly into sustainable development planning and management, the model shows convincingly that the integration of RES sources in Marina operations is the only possible course of action towards achieving a Zero Emission Marina.

To conclude addressing the research question, the analysis shows not only that the integration of RES sources in Marina operators can be cataloged as an innovative novel technique in MSDC model, but can be fully integrated into marina operations due to extensive support of pull and technology push policies available to the Croatian market.

4.2.2 Research Question Two

In respect to the second research question and stated objectives, analyzing the latest studies in the field in Section 1, one can identify several disruptive technologies fitting the novel techniques indicated by the MSDC model such as distributed generation and micro grids and smart grid networks. To directly answer the research question multiple recent state-of-the-art studies have been examined and analyzed to draw a general conclusion on the state of the disruptive technology integration. The systematic analysis of the cumulative rapports, studies and sources in section 1 show that regarding generation and grid the comprised 5-10yr range such technologies as nerovsketenbased solar cell are catching track, paving the way to BIPV. Regarding the grid, studies show that improving reliability and resilience of the electric grid will drive the development of new power system models such as open-access using advanced algorithms to optimize and control distribution and transmission.

A careful analysis of these studies shows large new grid investments particularly on distribution automation, transmission modernization, network operations software and grid analytics. Furthermore, improving power consumption profiles implies a development and proliferation of interconnected devices to allow applications such as fully automated demand response and energy management are paving the way for IOT network integration, pushing the boundaries behind the meter to create new communication layers for utilities. Among the early stage technologies identified within a 5-10yr span are micro and NG mobile payment-based off-grid electrification and perovskite solar cells. Furthermore, the case study analysis shows a strong scenario of utility companies losing touch with their customers with other players taking over the client's energy hub performing all routine and value functions for the consumer shifting focus from the grid to onsite generation and storage. At the same time, OEM's have been reported to acquire software technologies to foster analytical capabilities to their existing hardware and furthering their solutions towards end-to-end data management solutions for utilities. Furthermore, regarding metering, the common theme in recent case studies for commercial and industrial customers has been related to choice, control, comfort, convenience and collaboration thus developing a need for smart facilities to integrate energy controls with other site function of their operations. Such emergent technologies such as load aggregators provide load optimizing power consumption via dedicated displays for software applications replacing energy monitoring, big-data processing and data visualization technologies. Moreover, studies covered in section 1 show, that many products in the market today provide analytical, intelligent information based on history, preference, integration with other statistical data causing to increase computing and communication capabilities and building valuable data repositories to create energy hubs.

The general conclusion of the case studies systematic analysis that a future focus is emerging from individual energy devices and analytics towards complete integration and mastering of the operating system of all internet of things (IOT) devices inside the industrial, commercial site or residence. The rise of IOT and CPS Technologies is a predominant theme in all current literature with applications such as an intelligent greenhouse, intelligent transportation systems, power distribution grid, smart home, smart building and smart city. (Calvo et al., 2012; Shih et al., 2016) Further reports used in the analysis show a necessity of 3 to 7 digital devices with a total of network connected devices reaching 50 billion in 2020.

In parallel, multiple concepts and prototypes facilitate the deployment of IOT based grids in internal environment models such as Ahshan et al., 2017; Calvo et al., 2012; Chung, 2013; Hong and Chen, 2014 and Shih et al., 2016. These are small scale programmable and able to adopt DC-DC converters while accommodating the small scale DC power systems such as a PV array or small wind turbine. The standard architecture of all these prototypes involves the core design to bend the designed base on a distributed control unit integrating embedded IOT technology and utilizing IoT protocols to enable SG functions. (Shih et al., 2016; Tanyingyong et al., 2017)

Observing the commonalities of all cases analyzed, the standard approach for business owners is to build a small-scale SG and integrate DE sources such as renewable power generators with low voltage electrical systems to serve local users. The added intelligence such as two-way communication, sensing and advanced control capabilities are what makes grid smart, detecting and reacting to changes simultaneously.

In analyzing the conclusion of the systematic analysis, we must take into account the micro grid drivers as well as the enabling factors in section 2. The latest integration concepts concerning the ability of and IoT Platform to foster smart grid tech in one solution with energy management systems convincingly point out not only the possibility but becoming the standard approach for industrial and commercial sites.

4.2.3 Research Question Three

To address the third research question, the establishment of a criterion to assess the business viability was necessary. The assessment was conducted through multiple indicators starting with the results of the Kano model analysis and summary of the business plan elements in the upcoming Chapter 5 such as marketability and profitability through the market position analysis respectively the company's financials: the income statement and cash-flow projections. As previously observed in Section 4.1, 6 out of 7 product attributes (85%) are perceived by the customers as exciting and showcasing performance, with respective positions in the upper higher quadrants to a great

response percentage. Also, according to our potential clients, an overwhelming percentage of 92.8% would consider introducing renewable energy sources into their operations in the future.
Starting with the 7 product attributes, upon qualitative assessment and based on customer perspective the market position analysis had deepened our customer understanding regarding key purchasing attributes. Smart Marina has achieved a relative price score of 94.6 respectively 40.6 relative quality, the highest among potential competitors with a significant position in the upper-lower right quadrant. The projected results show that the company is successfully aligning key purchasing attributes to its unique selling proposition to achieve a promising market position, the differentiators directly addressing the attributes with the highest customer consideration.
Looking at revenue and profitability, after a modest start in Y1, with the pilot project deployment, the company will have a significant increase in sales of .6m EUR followed by doubling the revenue each consecutive year. The initial loss of 189k EUR will be followed by a net profit of 47k EUR in the second year, respectively 74K, 796K and 1.7mil EUR in Y 3,4 and 5. According to the cash-flow, the company will experience a negative cash-flow only in year 1, achieving a positive cash-flow of 57k in year 2 with a closing balance of 366 K EUR, when the company will also break even.
Taking into account the above points on answering our third research question and objectives, implicitly the high response percentages in the Kano model, as well as the market position analysis and supporting business plan results regarding profitability and financial standing, we can conclude in a convincing matter the viability of the Smart Marina concept.

5. Business Plan

The purpose of the business plan will have five key elements to be taken into consideration. Aiming at obtaining finances, the plan aims at determining the resources needed starting with existing resources, identify the resource needs, determine suppliers of needed resources and develop an approach to suppliers of such needed resources. (Hisrich, 2010) Furthermore, the plan will establish the direction of the firm, evaluate the resources of the firm through management by deviation and report results to stakeholders. Last but not least, through the above, the company aims at obtaining a joint venture partner. (Hisrich, 2010)

5.1.1 Description of business

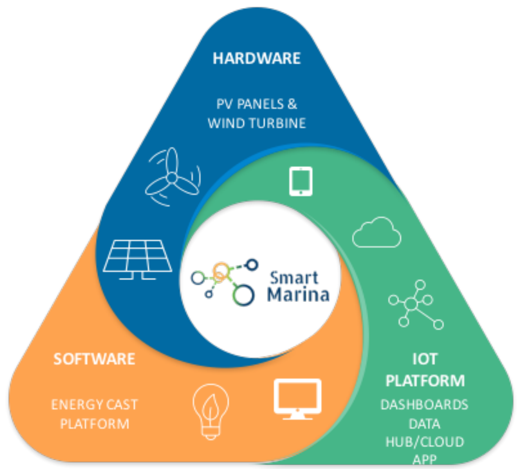


Figure 7: Smart Marina Integrated solution and Technological Components (own elaboration)

Smart Marina is a solution integrator and turn-key supplier of SG systems for Marinas and SMP's. The Smart Marina concept, our showcase product, comprises of integrating the three main technological components as observed in fig. 7. Each installation follows the course of a classic project commissioning.

5.1.2 Value proposition of the product/service for clients – Marina Operators

Connecting the product features depicted in the Kano Model analysis in the previous section and Fig. 8 with the platform advantages, the value proposition to clients consists of benefiting from all product features without initial investment costs, with a monthly payment in a lease-to-own model at the end of which they will have full ownership of the installation.

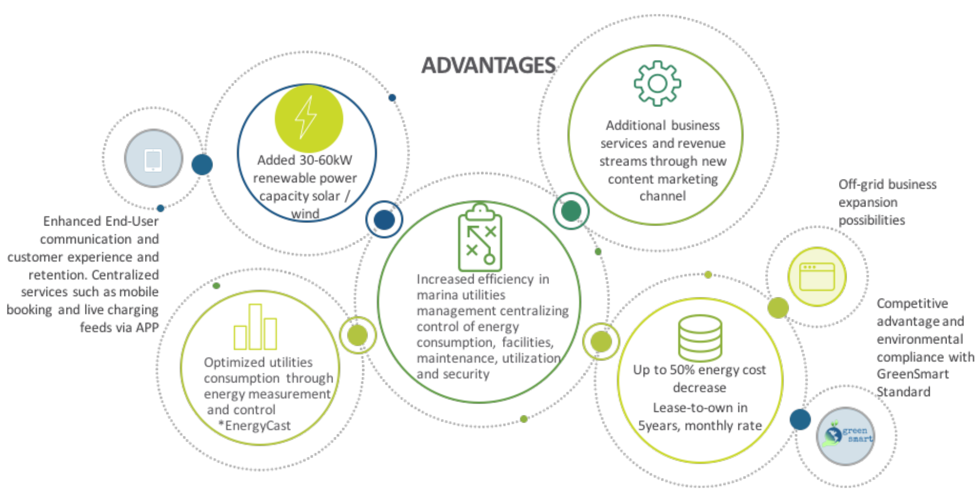


Figure 8: Smart Marina Advantages (own elaboration)

Primarily the added power capacity of 30-60kw through a hybrid RES entails on average a total potential power generation of up to 143,089 kWh/year. By integrating RES into their operations, marina operators achieve the highest status of sustainable development for their EMS planning and decrease their energy costs. The clients benefit from optimal utility consumption and enhanced energy management system as well as a centralized marina management and all-in-one control dashboard. This fosters and integrated workplace management system (IWMS). The system enables functional models across facilities and space management, maintenance and environmental and energy management within a single technology platform improving service management and reduces costs of maintenance and operations. The availability of a data hub, cloud and digital ecosystem, including analytics of system and consumer data provided by the third component of the solution offers intelligent automation, guided analytic discovery, data refinement and integrated social business as mobile booking and additional business services bringing a significant contribution to Marketing and Sales. The analytics will help prioritize leads, increase the conversions and plan campaigns to discover the most profitable customers and in turn lowering costs through efficient targeting. Furthermore, the use of the digital ecosystem will enable the marina to acquire additional revenue streams by exploiting new channels to market for boating industry companies and adjacent services. Additionally, the direct user communication via APP, with incorporated business services, as well as feed integration enables the marina to report and have a dashboard creation and visual storytelling all-in-one. Primarily, the system was designed to address the needs and creating value and benefits for the customer, constituted by the marina operators which are placed at the core of our value proposition with the most advantages. For our clients to be successful using our platform, the company has taken in account different benefits concerning the other key stakeholders such as the boaters, businesses in the boating industry including service and repair, small business owners for adjacent services and environmental NGO's such as the Blue Flag initiative. Concerning boaters, and the values gained from the new services, primarily the most significant advantage lies with centralizing all services having access to information first hand via App. In turn, they will be supporting an environmentally conscious business and benefit from an array of tailored services specific to their needs such as repair, maintenance, priority berth booking services and additional business services the marina offers.

Companies in the boating industry can seize the opportunity to market further their products negotiating discounts with the marina operators and ensure accurate targeting for potential customers. Their services will be made available for boaters within the marina mainframe and provide a direct channel to their potential clients. At the same time, NGO's such as the Blue Flag Initiative can seize this opportunity to further their objectives of protecting the environment and showcase the Smart Marina platform as the next level environmental accreditation due to its zero-emission and environmentally friendly capabilities. The platform, in turn, can become the next showcase example for "novel applications and techniques" as outlined by the MDSC Model.

5.1.3 Description of the venture

The venture will be founded in Croatia, a company with limited liability (legal form: d.o.o) and headquartered in Rijeka, near all clients such as ACI Marina HQ. Starting the business, the company requires 0,1 m Euro from founders as blood capital and 0.4 m Euro from investors equity in year 1. To raise the money, primarily the company would need one or two investors with the following share distribution: 40% founder 1, 40% founder 2, 10% investor, 10% investor 2 respectively 20% in the case of a single investor. Each of the investors must invest 0.2 m Euro to obtain 10% of the company. Based on the above, the company valuation will reach a valuation of 2 mil. Eur. It is trivial to find such investors supporting the new venture with additional know-how, contacts or supplier network. Since its inception, the company will have a CEO and CTO. After the first year ends and the lighthouse project is completed 3 people will be brought into the team, a CMO, CFO, and COO with the primary purpose of keeping the venture lean and by using outsourcing and consortium-based project work.

5.1.4 Mission statement

It is important to us to have a clear vision and mission statement for Smart Marina to show what the company, the people who work for it and stand for. Our vision and mission should also help our employees to identify themselves with the enterprise.

Our Vision

Enabling operators to achieve a zero emission marina while gaining a competitive advantage through the use of a smart grid solution tailored to each of their needs.

Our Mission

To create economic and social value on a global scale by driving sustainable development through the integration of renewable energy sources and latest related technologies in MNP operations.

5.1.5 Business Model

Smart Marina operates as an independent third party solution integrator and provides customers with a customized solution incorporating three elements: the hardware renewable energy distribution systems (solar and wind), a software platform and an IOT platform and digital ecosystem. The company provides engineering services, project development via established suppliers, operation & maintenance, procurement, and construction, as well as financing.

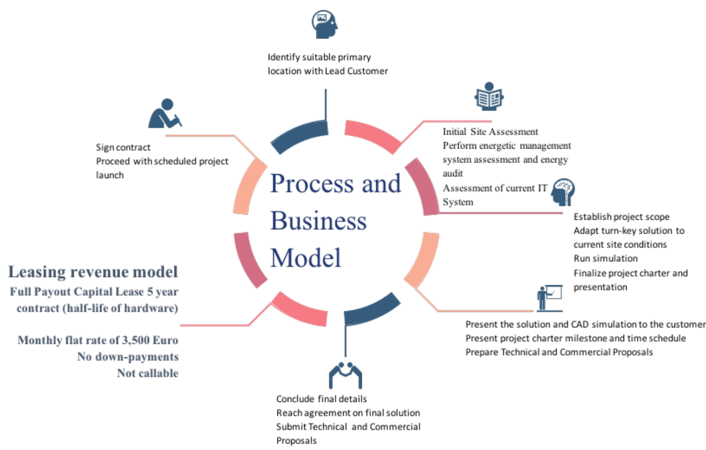


Figure 9: Process and Business Model (own elaboration)

The process and business model in fig. 9, entails starting with the initial customer contact and identifying a suitable location with the first customer. Upon an initial site assessment, management system evaluation and energy audit, the current IT system will also by assessed. Based on the findings, a project scope will be established to adapt the turn-key solution adequately to existing site conditions. Upon completion, a CAD simulation will be conducted, then finalizing the project charter and presentation incorporating the proposed solution. The solution will be further presented to the customer along with the project charter milestones and suggested time schedule. Next, technical and commercial proposals are to be prepared based on the current documentation and RFQ. The standard validity of the proposals shall not surpass 30 days, time in which the customer will be contacted again and quote re-issued. Both technical and commercial proposals will be submitted for customer revision an approval and consolidated in the opportunity pipeline.

The contractual agreement will have at its base a Leasing Revenue model implying a full payout capital lease 5-year contract, which represents the half-life of the hardware as well as the length of the warranty. A monthly flat rate of 3,500 Euros will be charged for 5 years, after which the client will hold complete ownership of the installation. There are no down-payments, and the investment is not callable.

How it works for clients

1. Project briefing - The clients start their project online easily by registering on our website and completing the project briefing on the Smart Marina platform or by calling one of our account managers and fill out the initial project briefing together.
2. Matching - According to your requirements Smart Marina will assess the current site conditions and match client requirements as per fig. 9 above to provide a tailored turnkey solution. This will be conducted through a specialized form, encompassing all site specifications and technical specifications of the platform. Based on the input, the client is matched and confirmed to the right solution while being presented with custom based cost savings model.
3. Contract signing - The signing of a contract with Smart Marina is quick and easy. Once you have made a binding decision on the solution, we will prepare the contract documents for you.
4. Project work - The execution of the contract will go according to the project management documentation matching the commercial and technical quotes and specifications. The communication throughout would consist of our account manager, client management representative and supplier representatives under a steering committee framework. For the pilot project, the project management role will be taken by our CTO upon the full development and implementation of the solution. A complete detailed project management workflow can be observed in the Operational Plan at page 67.
5. Feedback & Payment - A monthly invoice of 3,500 Euro will be dispatched via our Accounts Receivable department based on the agreed contractual dates. All feedback will be conducted and communicated via our account manager.

5.2 Technology Plan

Although all elements are already available on the market, the idea consists at integrating these technologies into a turn-key solution speculating a market gap and exploiting the first-mover advantage while consolidating our brand, this part of the technology recognition value is significant. Therefore, a unique style and branding are important. As a solution integrator, Smart Marina will utilize existing and latest technologies on the market and work with the suppliers of such technologies to integrate the technological streams into a turnkey solution as represented by fig. 10 in the next section.

5.2.1 Description of the technology

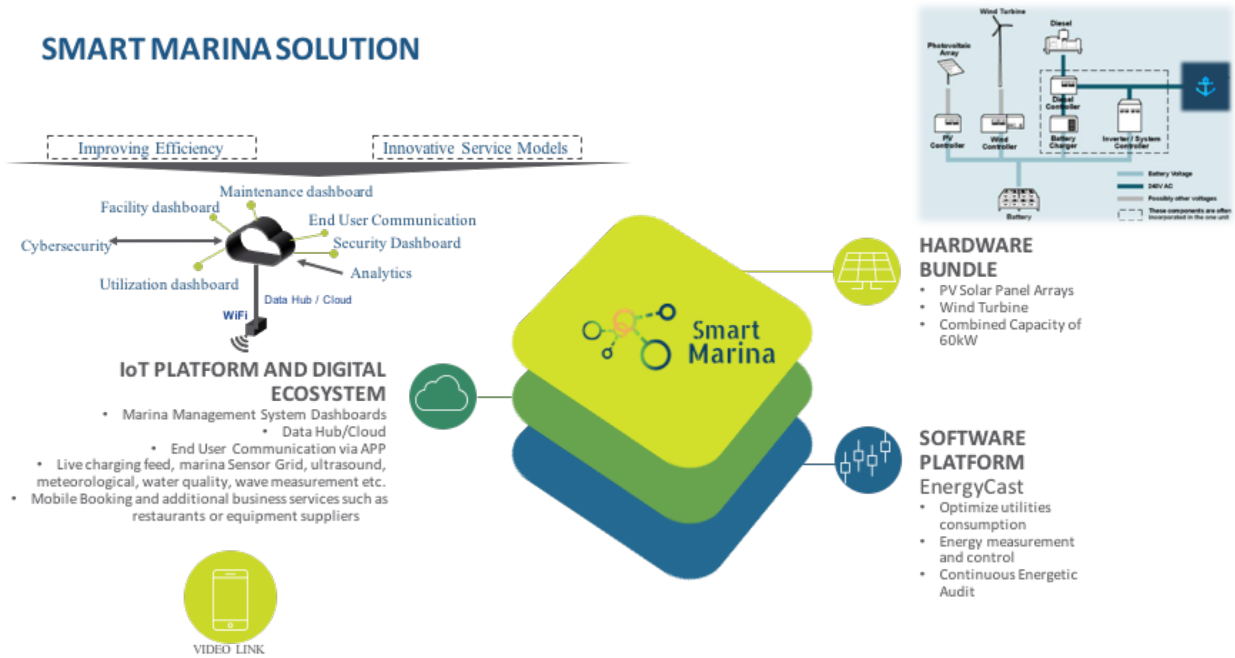


Figure 10: Smart Marina Concept Architecture (own elaboration)

5.2.2 Hardware:

The hardware bundle in our solution will include a photovoltaic array, a wind turbine, PV controller, Wind Controllers, Battery Suite and inverter/System controller. The combined RES capacity will top 60kw. Regarding the solar plant, the technology will include a Hydraulic floating solar system supporting 100 panels of 315 Wp Renesola modules covering about .44 ha water surface and deploying a combined power of 32kWp. The system will be backed up by an anchoring system, the bottom anchoring with percussive driven earth anchors will be designed to meet a maximum depth of 3.0 m and a level variation of 0.45 m. As observed in figure 11, the main float supporting the PV module is based on the latest technologies in the field of a picture representation of a similar system in the USA.

Figure. 11: Example of 32kWp installation and description of floating PV Technology (Ciel-et-terre.net, 2017)

Concerning the wind turbine, the system will include an Aeolos – H30KW power 30, max power 40Kw turbine as observed in Appendix I. The turbine is sustained by a monopole (18, 24, 30m) or hydraulic tower (18,24m) with a rotor diameter of diameter 12.5m speed 90rpm blade material Fiber Glass Generator. The turbine has a direct drive permanent magnet generator operating a voltage of 360VDC (grid-off) 450 VDC (Grid-on) Controller. The touch screen PLC system as observed in fig. 12 enables remote monitoring. Both systems cover a 5year warranty. Configuration for both On-grid and off-grid scenarios are depicted in fig 11.

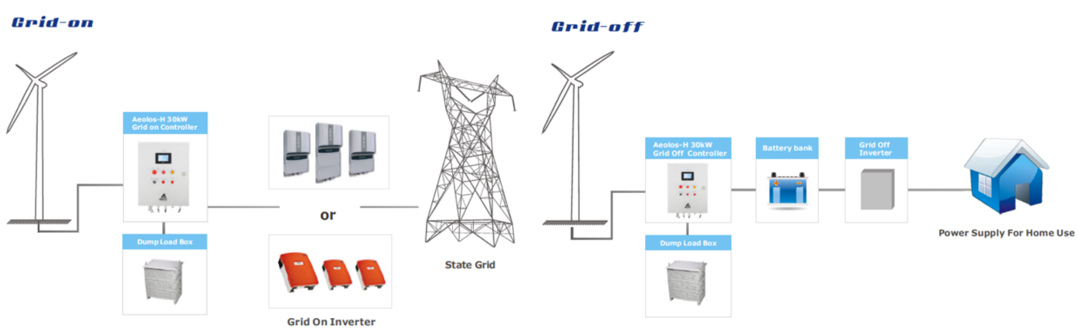


Figure 12: On-Grid and Off-Grid conf. for Aeolos WT system (Windturbinestar.com, 2017)

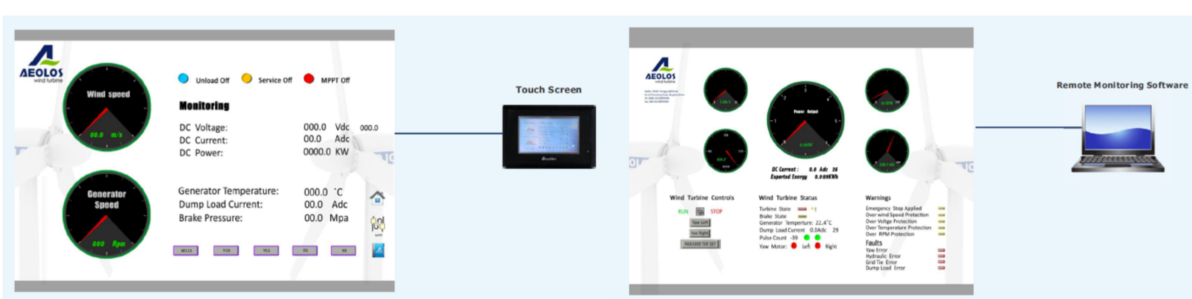


Figure 13: Touch Screen PLC System of Aeolos Wind Turbine (Windturbinestar.com, 2017)

Aeolos-H 30kW Wind Turbine ANNUAL Output									
Wind Speed(m/s)	3	4	5	6	7	8	9	10	11
Generator Power(W)	450	1120	2300	4090	6780	10500	15500	22050	29600
Annual Energy Output(kWh)	7884	17660	34252	57325	89089	128772	176514	231790	311155

Table 3: Aeolos – H30kw Wind Turbine Annual Output (Windturbinestar.com, 2017)

The PV array power generation enables on average 54,000 kWh/year within a 5PSH x 30kW =150kWh/day calculation, while the wind turbine as observed in figure 20 has an 89,089 kWh yearly output at a middle range of 7m/s wind speed. This brings the total generation to 143,089 kWh/year using reasonable efficiency assumptions. Taking into account the current tariff in Croatia at .25 Euro/kwh, after five years of use the system will generate the equivalent value of 178,861 Euro energy worth that can be resold to the grid or used for site consumption, being capable of breaking even within the five years of operation. Respectively, the monthly energy value is 2,981 Euro representing an 85.1% of the monthly system price of 3500 Euro.

The battery array will consist of 3-6 Hybrid Tower of 10KW (three-phase capacity) with a maximum charging power of 9600W respectively a PV input (DC) of 15,850W per 10kw unit. (fig 21) The grid nominal and load output (AC) is 230 VAC (L to N) /400 VAC (L to L). The AC start-up voltage range is 120-140 VAC per phase. The battery capacity in kWh is 9.6 kwh/14.4 kwh with the following dimensions: 1550 x 650 x 650 mm weighing 480kg. The interphase is RS-232/USB with optional Wi-Fi capabilities and Optional SNMP, Modbus and AS-400 intelligent slot. The full technical specification can be observed in the product brochure in Appendix I.

Regarding inverters the system will use the Trio – 50.0-TL-OUTD/Trio- 60.0-TL-OUTD-480 ranging 50 to 60kw from ABB String Inverters (fig. 14) which foster the advantages of a decentralized configuration and has a modular landscape design enabling flexibility in installation. The separate and configurable AC/DC compartments allow separate wiring as the systems carry a complete wiring box configuration available including 16 DC inputs with fast connectors, monitored fuses, switches and controlled type 2 AC/DC surge arresters. The system has a Tran-formless topology with every inverter set on specific grid codes selected directly in the field, separate AC and DC compartment with different configurations, a wide input range with both vertical and horizontal installation. The full technical specification can be observed in Appendix I.

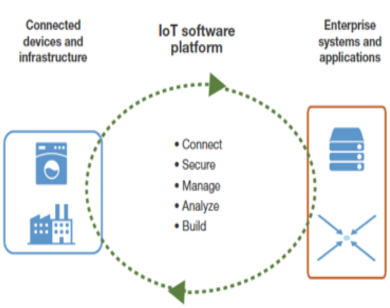
Fig. 14: ABB 50-60kw Inverters and Hybrid 10kw Tower (New.abb.com, 2017)

5.2.3 Software:

IOT and Energy Management:

Each vendor's current offering was evaluated through the Forrester report findings and, according to the functional categories of connect, manage, secure and analyze. Specifically, we considered cloud integration and protocol support, the strength of the management console to manage virtual devices, developer support through SDK and prebuilt applications, and the platform's access management functions and identity. A ranking of best suppliers can be observed in fig. 16. Additionally, each platform's capacity for analytics was examined, including predictive analytics, augmented reality, and edge analytics, a depiction of the base operating mode being represented by figure 15.

Figure 15: IoT Software Platforms Integrate Edge Devices with Enterprise Systems (Forrester report, 2017)



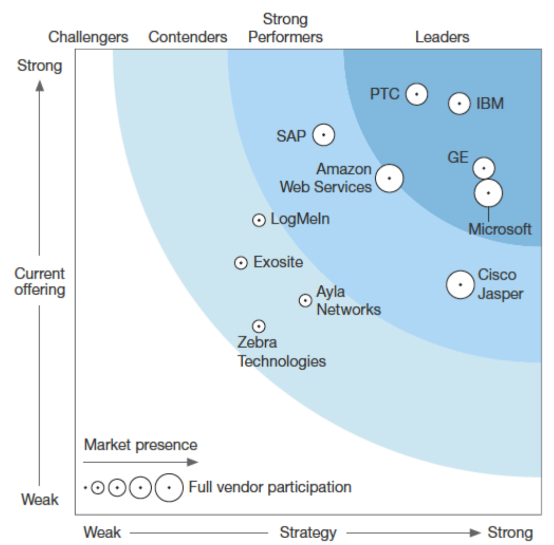


Fig. 16: IOT Software Platforms Q4, 2016 (Forrester report, 2017)

The IBM Watson IoT Platform will serve a broad range of advanced IoT use cases with added significant capabilities to the platform and was chosen due to its open source standards and a robust global partner ecosystem to ensure compatibility. Regarding the features, the platform will offer data preparation, refinement, management and analysis, automated and available from the cloud. Furthermore, automated intelligence will and visualizations provide a better understanding as observed in the fig. 17 below:

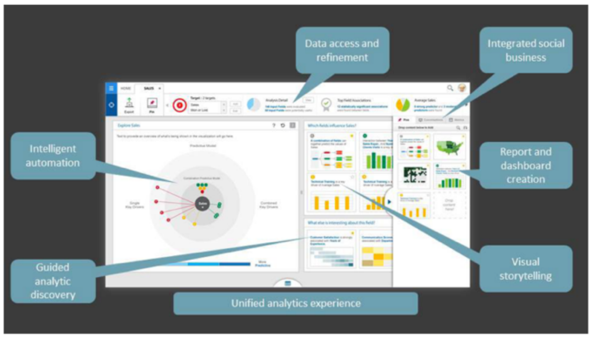


Fig. 17: All-in-one place Watson Analytics (Ibm.com, 2017)

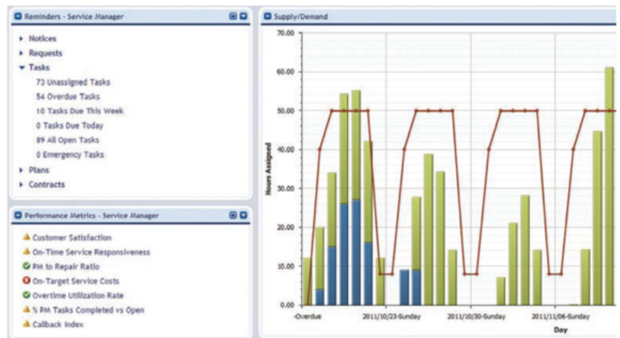


Fig. 18: Alerts, metrics and reports within IBM (Ibm.com, 2017)

The required and specified functions of marina management system dashboards as well as end-user communication via APP will be incorporated as well as booking services, additional services and places of interest as well as live charging feeds, marina sensor grid, ultrasound, meteorological, water quality and wave measurements as observed in fig. 25. Furthermore, Watson Analytics offers intelligent automation, guided analytic discovery, data access, and refinement, integrated social business such as mobile booking and additional business services, report and dashboard creation and visual storytelling all-in-one.

In respect to energy management, the IBM's solution for workplace data integration is IBM TRIRIGA delivering integrated workplace management system (IWMS) which will automate demand and preventive maintenance services thus improving service management reducing the costs of maintenance operations. Besides, the facility assessment features will track and evaluate building and asset deficiencies and the identification of opportunities improving the environmental condition by extending the life cycle of plant assets. As observed in fig. 18, IBM Tririga will improve the value and environmental performance of the assets of the facility by identifying and resolving system and asset deficiencies while allowing the customer to evaluate the required investment, energy, and operating costs, as well as the ROI on each opportunity. Furthermore, the platform will automate the work request generation and capital project by managing the resolve of deficiencies and implementation of environmental opportunities..

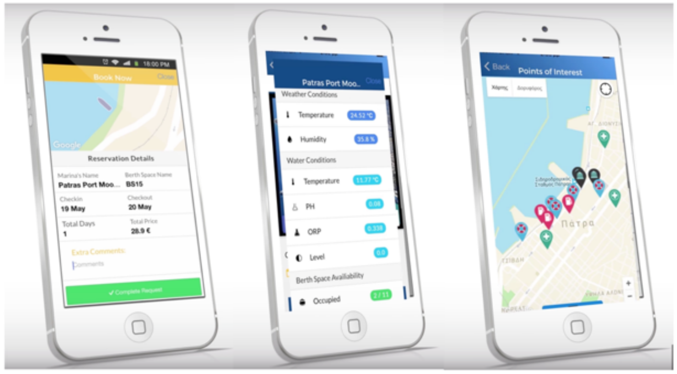


Figure 19: Smart Marina APP features (own elaboration)

Description of industry

In Europe, we have 70,000 km of coastline, 20,000 km of inland waterways including 4,500 marinas, 6 million boats and 1,75 million berths servicing 36 million boaters. (European Boating Association, 2015) The European boating industry reached more than 20 billion turnovers and encompassed over 38,000 companies with 3000 in manufacturing such as boatbuilding, equipment, accessories with 50,000 direct employees. (European Boating Association, 2015) The remaining 35,000 are comprised of services such as trade, repair, and maintenance, marinas, charter, crew schools having 230,000 employees. In total, there are 48 million people enjoying watersports. (European Marina Association, 2015)

Marinas realize a turnover of almost €4 billion and employ approximately 40,000-70,000 people. Like the charters, there is a strong seasonal influence on demand and turnover. Marinas can be distinguished broadly in private and publicly owned marinas. There is a trend towards private owners that operate a chain of marinas or marinas that are organized as a network (clusters). These clients and clusters will be further detailed in the marketing section under lead customer profiles such as ACI and Transnational Marina. Most of the marinas are located in a limited number of Member States (SE, FI, UK, NL, DE, FR, IT, GR, HR). (European Marina Association, 2015)

The nature of the competitiveness assessment of the services differs from the manufacturing industry. Notwithstanding the rise in marina chains and networks, most marinas operate at a local or national scale. Key issues to them are related to difficulties in national/local regulation and local/domestic market conditions, although to some extent they might be influenced by national or

EU law. It also makes it a rather fragmented market with many individual players each operating on their own regional/local boating market. Nevertheless, obviously, there is a connection to the overall attractiveness of coastal region as they form part of the overall tourism package.

5.2.4 Future outlook and trends

Manufacturing Industry

A recent The SWOT analysis from the Competiveness of the Boating Study by ECSIP (Appendix G) indicates that performance and foresight for the manufacturing industry are still mainly positive. (ECSIP Consortium, 2015) The sector has a strong global position and benefits from exposure of high-quality E.U brand while still being innovative. At the same time, the industry could take advantage of the growing demand in upcoming markets, implicitly the need for the universal friendly technologies and the further harmonization of standards. (ECSIP Consortium, 2015)

Marinas

For marinas, the policy potential lies with the improvement and establishment of framework conditions that cause a drive to improve the quality of the offer from a European and sector perspective and not only from a local perspective. Specifically, there is potential in the following fields, where there is also an important role for the industry itself and member states. To ensure smooth cross-border movement of boats within Europe to improve the functioning of the internal market. Additionally, there is potential in supporting the ability of marinas to keep the quality of its services high or even increase it, thus keeping demand high. Furthermore, here is a potential in the promotion of recycling of industrial craft vessels as well as greater support for the coordination of cluster development between marinas in Europe. Additional details and SWOT analysis are found in Appendix G.

5.2.5 Competitor analysis

The energy system competitiveness in Croatia is quite satisfying, and it's defined by to two main observations. The structure of the electricity generation is diverse and has a relatively high share of local natural gas production. Secondly, there are several mechanisms for retaining and increasing the competitiveness of the energy sector such as the energy market development, country openness, investment risk sharing, technological improvements as well as increasing local generation, promotion and exploitation. Related to RES Installations, we can observe at the significant number of project owners (673) suggesting a great actor diversity in solar powered plants and with a little average size of 36,2 kW. This entails a powerful home system application rather than a targeted category. Solar alone has an installed capacity of MW of 43,98 with 1213 installations on the market. Mainly this represents the B2C segment (residential) with a significant B2B market (commercial and industrial) to tap. We can state that the competitiveness is satisfactory due to the diversity of applications, market gap and a significant number of opportunities. Due to the first mover advantage, innovativeness of the solution and no equivalent products on the market with no immediate competitors, the competitive landscape was analyzed by taking in account the majority of players that already possess or could develop similar solutions in the short term after launch. The potential and future competitors were categorized as OEM's (GE, Siemens), Domestic RES System Suppliers (Energoberen HS, Energy Pluss d.o.o, Ekotect Energia), Large Energy companies (RWE, GEN-E, HEP Group), companies with direct application for MNP's (Onminflow And Sammyaht). and RES OEM Suppliers (ABB, Aeolos, Ciel-et-Terre)

To conduct a comprehensive analysis of our competitors, a market position was concluded taking in account two principal elements. First, the Smart Marina product features and qualitative data from direct customer feedback and Kano model results were developed further into nine key purchasing attributes with respective quality weights. As further observed in the detailed Market position analysis in Appendix E, the attributes are: (1) Constant system and service quality from RES power generation at 30%; (2) Delivery time at 3%; (3) High performance of energy management systems at 20%; (4) Technical Support 10%; (5) Quality of sales force at 2%; (6) Product/Services range and degree of customization at 5%; (7) Digital Ecosystem and data hub innovation performance at 10%; (8) Quality of App for direct client communication at 10% and (9) custom specialized services integration (feeds) at 10%. Secondly, several assumptions were drafted based on website mining of the above competitors regarding products and services in corroboration with customer feedback. These assumptions were used to directly impact important market position analysis metrics such as purchasing decision with a 65/35 Quality/Price split as well as nominal values for the relative price. The underlying assumptions concerning OEM's and large energy companies are that they require substantial investments and resource allocation not justifying the niche market opportunity. Furthermore, due to the nature of the corporate structure, often rigid, they will experience increased costs and high resource allocation entailing higher ratings in the key purchasing attributes. At the same time, this can be an opportunity for energy companies to stay in touch with their consumers (prosumer trend) and market the system at a small price to capitalize long term through additional services. Another assumption concerning Domestic RES System Suppliers is that despite their experience in RES they lacked the technological experience concerning the digital ecosystem, platform and customized specialized services integration leading to a significant change in the organization and high allocated budgets regarding R&D. Regarding RES OEM Suppliers, we assume that high margins on system components, in-house production, and Engineering capabilities carry the greatest risk of becoming a significant competitor with IOT capabilities obtained via consortium based strategic alliances ensuring a complete solution. Lastly, for the companies with direct applications for MNP's the assumption is that the acquisition of technical competencies to provide a fully integrated solution would be difficult due to the limited size of the organization entailing a complete change in business models. Bridging the two elements of the market position analysis, associated weights and competitor rating our study shows Smart Marina to be placed in the lower right quadrant with a relative price score of 94.6 respectively 40.6 relative quality. Observing the behavior of our closest competitors we can notice the relatively high price for both OEM's and Domestic RES System Suppliers. While GE, ABB and Siemens maintained a higher relative quality of 26, 20 and 7.3, the suppliers experienced negative relative quality ranging from -20 to -36.1.

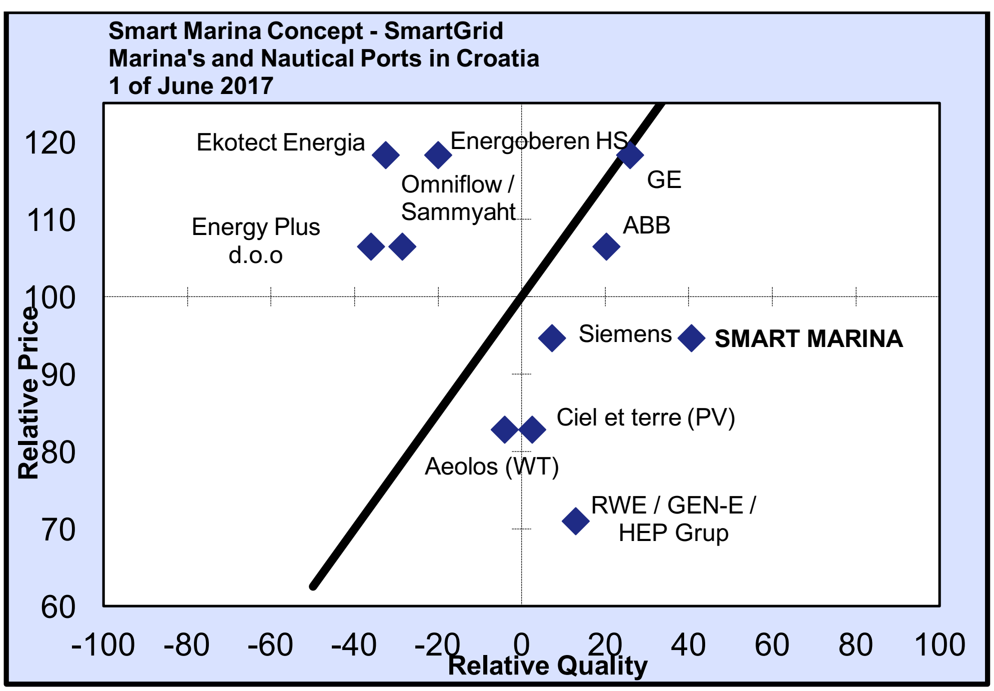
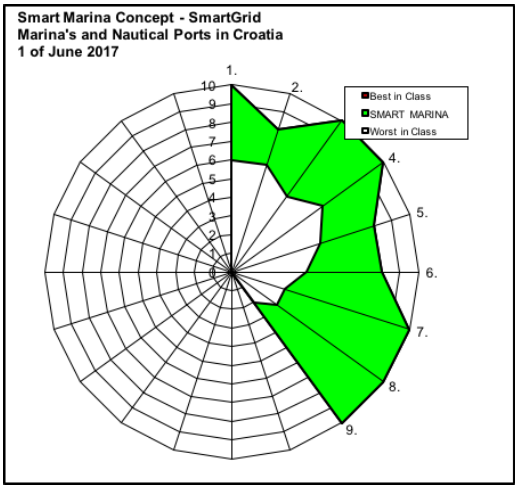


Figure 20: Market position analysis (own elaboration)

Based on the analysis results, one can state the company suffers a promising market position with several threats from competitors. The closest to relative quality and price that can close the gap are OEM' which can make further improvements to improve the key product attributes. At the same time, RES OEM suppliers are in a good position and could level the playfield by strategic alliances to improve the IoT and digital ecosystem capabilities. Furthermore, the large energy companies can present a fierce competitor regarding price.



Quality : Price 60 : 40	rel. Price	rel. Quality
SMART MARINA	94.6	40.6
GE	118.3	26.0
ABB	106.5	20.2
Siemens	94.6	7.3
Energoberen HS	118.3	-20.0
Energy Plus d.o.o	106.5	-36.1
Ekotect Energia	118.3	-32.6
Ciel et terre (PV)	82.8	2.6
RWE / GEN-E / HEP Grup	71.0	13.0
Omniflow / Sammyaht	106.5	-28.6
Aeolos (WT)	82.8	-4.1

Figure 21: Rating to best in class and rel. Price / rel. Quality results (own elaboration)

Our projected results in the best in the rating best in class in figure X prove that aligning the key purchasing attributes to our unique selling proposition we can achieve and maintain a promising market position. Our differentiators address the key attributes with the highest customer consideration that are not dependent on OEM equipment such as (6)-(9) which address the product range directly, the degree of customization, digital ecosystem, and innovation performance as well as APP and specific services interactions. The main differentiator is the precise targeting of the MNP segment, a niche market and ability to incorporate multiple technologies from different OEM's. Another differentiator is the customized platform, specific integration layers, and specialized services integrations exclusively designed for MNP operations as direct upgrades to their existing environmental management systems and ISO 1800 and 9001 Implementation. Furthermore, our company will plan on differentiating regarding transparency in cost and quality provided as well as excellent user experience and complete control over the boating experience in the marina.

5.3 Marketing Plan

The primary purpose of our marketing plan refers to understanding and satisfaction of target market needs while assessing the know-how of various marketing variables. These variables can perform separately and together influence the market (Hisrich, 2015) Throughout the next section; we will define the organizational goals and objectives, and understand the market, concept of newness to the organization, consumers, and distribution system. Furthermore, the future trends, growth rates, and competition will be explored. (Hisrich, 2017)

5.3.1 Market Segment

Identifying the bases for segmenting the market, throughout the next section we will develop the profiles of the resulting segments through efficient market targeting and positioning. We will start by evaluating the attractiveness of each segment, select the target segments and identify possible positioning concepts for each target mix. (Hisrich, 2015) The segmentation criteria are industrial, geographic (Croatia) and take into account philological attributes such as the degree of technical leadership. (Hisrich, 2015) Furthermore, the benefits for such segment (industrial) lies with dependability, the reliability of seller and support service, efficiency in operation or use and enhancement of firm's earning durability. The volume of use is in term medium with controllable market elements such as price, service, warranty, and reputation of the seller. (Hisrich, 2015)

We aim at a market share after five years in Croatia, of 31 units, a significant 72% for existing large marinas in Croatia. Although at this stage is quite difficult to estimate the entire market due to the system and legislation difference across multiple international markets, overall in the European landscape, 91 systems in Y5 will account for .06% of entire EU market entailing a vast sales potential throughout and significant market share to be gained.

Sales/units

	Year 1	Year 2	Year 3	Year 4	Year 5
Croatia	1.00	10.00	10.00	5.00	5.00
Montenegro	0.00	1.00	3.00	0.00	0.00
Italy	0.00	5.00	10.00	20.00	20.00
	1.00	16.00	23.00	25.00	25.00

Table 4: Sales in Units Y1-Y5 (own elaboration)

Our entry market is the Republic of Croatia due to existing lead customer network in the ACI club association enabling the possibility of multiple installs and building a robust reference base. The first mover advantage due to the innovative solution, in-line renewable policies with EU objectives as well as multiple bootstrapping options through support schemes such as HBOR loans up to 75% with 2% interest rate, interest-free environmental loans (HBOR, 2015) as well as Horizon H2020 possibilities strengthen the choice. Furthermore, the propagation of current RE project of 673 Project owners suggests a great actor diversity with the 36,2kw average size entailing a powerful home application. Lastly, the On-grid and off-grid segmentation potentially allowing installs on the 79 islands or 525 Islets creates a significant opportunity for our system. Last but not least, the Central – SE Europe geographical location makes enables the future formation of clusters incorporating nearby marinas from Greece and Italy.

The customer profile – Marinas

Ideal for sailing, Croatia it has an indented coastline, many islands, a good climate and 45 marinas with excellent facilities and service which represent our core customers and primary target. About 50% the marinas belong to the ACI Club (Adriatic Croatia, International Club) and the others are privately owned. All Croatian marinas are members of The Croatian Marinas Association whose head office is in Rijeka. (Marinas.com, 2017) Currently, in Croatia there are two kinds of marinas, privately owned some partnering up with industrial companies and marinas operated by the Adriatic Croatia International Club (ACI) with the head office in Opatija. All are offering standardized services at same terms and conditions. Fees are charged in the Croatian Marinas for berths and other services. The prices are usually fixed and published in the fall for the following year. Regarding public piers, in harbors under municipal authority, the local authorities have the right to charge mooring fees. (Marinas.com, 2017) One of the main commodities offered by the marinas, fuel is available both on roads and in harbors. (Marinas.com, 2017 All the Croatian marinas and some harbors provide water and electricity hook-ups on the pontoon-piers. Regarding water, water connections are usually 1-inch in diameter, 3-inch diameter connections are much less frequent.

Furthermore, there is a significant number of small off grid marinas that due to geographical location and inability to connect to the network have to rely on diesel generators to satisfy energy requirements of their operations and docking boats, being unable to expand services without significant costs. This will align to the future technologies in section one under mobile based payment off-grid electrification. There is a need for alternative systems using renewable energy sources to optimize expenses for marinas and services offered such as restaurants, beach bars, etc. A simple calculation is showing the operation of a small 30kw diesel generator at full load as observed in the graph below for 12hr each day at 2.9 gal. (10.9l) at 1.22 Euro/h can result in costs up to 4708 Euro/Month.

Load	Diesel L/h	h	8hr/day	12hr/day	M8hr	M12hr
½ Load	6.8l/h	8.16 €	65.28 €	97.92 €	1,958.40 €	2,937.60 €
¾ Load	9.4l/h	11.28 €	90.24 €	135.36 €	2,707.20 €	4,060.80 €
Full Load	10.9l/h	13.08 €	104.64 €	156.96 €	3,139.20 €	4,708.80 €

Table 5: 30kw Diesel Generator consumption chart (own elaboration)

Lead customer profile

To ensure a robust reference base and the opportunity of multiple installs, Smart Marina will target large marina operator groups and associations. In Croatia, the Adriatic Croatia International Club, ACI represents an operator of 22/43 Marinas with various facilities and services accommodating 400,000 boaters yearly. (ACI-marinas.com, 2017)

Another lead customer profile, Trans-Europe Marinas comprises the largest marina group in Europe spanning ten countries and providing close to 40,000 berths in 74 yacht harbors. (TransMarina.com, 2017) Sequential targeting of these primary lead customer profiles and groups will allow an expansion further into the EU market given various install capabilities and established a reputation.

5.3.1 Pricing

The Smart Marina Solution will charge a price of 3,500 Euros monthly as detailed in the Business Model Section previously by the agreed and specified date. The price takes into consideration a 5year contractual agreement based on the Leasing Revenue model with a full capital payout at the end of which the customer will hold complete installation ownership. There are no down-payments, and the investment is not callable. Based on our projections, costs, and expenses the margins are relatively high reaching 69% in year five based on our sales projections. (Y1: -23%, Y2:68%, Y3: 52%, Y4: 66%) Furthermore, based on our calculation, the monthly COGS per system is 1,666 EURO with a total system cost of 100,000 EUR.

Price per unit/monthly	3500 EUR
Turn-key Energy system Sales Price	199,000 EUR
App monthly subscription / user	0.99 EUR
Production Cost Power System /month	1666.66 EUR
Cost Platform	1
Total Energy System Cost	100,000 EUR
Energy System Cost / month	1666.66 EUR

Table 6: Prices and Costs per System Breakdown (own elaboration)

5.3.2 Promotion

We have to promote our marketplace in three ways from the start. First to attract the customer, the marina operators on the market, secondly to capacitate the environmental NGO's such as BlueFlag and thirdly to promote within the boating industry manufacturing and service companies as well as supplier network to expand corporate profile. The digital marketing and promotion campaign will be comprised of four phases, one per quarter as per further details in the operational plan on page 68. The primary focus of the promotion campaign would be to reach the target audience while consolidating our on-line presence and brand development. It is paramount we sustain the brand development with on-going campaigns, keeping us relevant in the industry and marketplace. Furthermore, brand development is a fundamental element in our exit strategy to capitalize on making the concept and brand attractive to potential buyers such as large energy companies, one of our large suppliers as well as NGO’s such as the Blue Flag Initiative. Therefore, we developed three way-channel promotion strategy.

Channels to customers:

At the very beginning, we will start to promote our solution actively to all 43 Marinas in our entry market meaning the following main activities:

- Salesforce recruiting new clients and active emailing, newsletters in our network
- Social media contact via Facebook, LinkedIn, Instagram, Twitter, etc.
- Specific Google AdWords campaigns using keywords as described in this paper
- Press releases and Blogging

- Boating Industry Exhibitions starting with Biograd Boat Show in Croatia and exploring similar shows
- Presence and advertising in the yearly Marine Directory

Channels to boating industry companies/suppliers:

To enhance our corporate profile, we will do the following:

- Partnership with manufacturer/s
- Marketing (advertisements, promotional activities, etc.) in Marine Directories and magazines
- Ongoing purchasing activity and sales force interaction
- Cooperation/partnerships with supplier and industry companies
- Use of professional social media, e.g. LinkedIn

We plan to use the following marketing KPI/s:

- CAC = Customer acquisition costs and CPA= Costs per acquisition
- CLV= Customer lifetime value and ROI on marketing and sales campaigns
- Gross Margin Ratio and Return on Capital Employed

Additional services in the future

Beside the main revenue stream, Smart Marina will offer additional services in the future to generate incremental revenue. Some will include maintenance and service agreements past the 5-year initial contract. Upon contract completion, existing installation requires maintenance and service. Also, warranty extension packages can be introduced as auxiliary to the maintenance and service contracts. Furthermore, Smart Marina could engage in selling market information to the boating industry marketing companies as the company gains a lot of valuable data regarding energy consumption but also significant client behavioral data via the application and integrated services.

5.3.3 Sales for the first five years

Concerning the sales for the first five years, taking into account the sales forecasts mentioned in the marketing plan section we are expected a small revenue generation based on the Y1 pilot project deployment of 21,594 Euro followed by a significant increase in .6 m Euro the following year entailing 16 products sold. In Y3 we anticipate sales of 1,2 m Euro necessitating 23 systems followed by 2,6 m Euro respectively 4.5 m Euro in years 4 and 5 with 25 systems sold in each.

The projected figures related to our market penetration can be observed in the graph below with the following results:

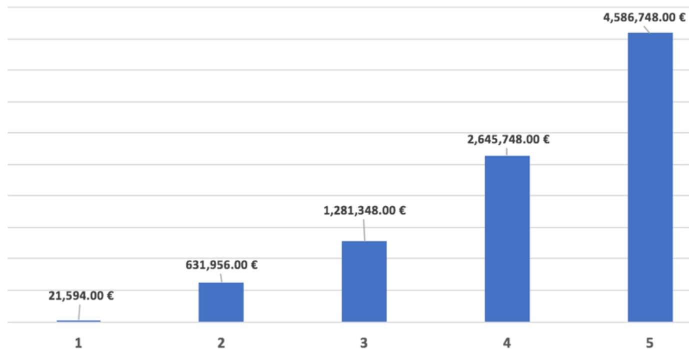


Figure 22: Revenue Y1-Y5 (own elaboration)

5.4 Financial Plan

Based on our assumptions we are planning to reach break-even in year two. Due to pre-existing requirements for bootstrapping options, we will not have a ramp-up phase, and we will set up the company starting operation from day 1 ensuring a consistent fiscal history in the target market to providing meeting the criteria for available support schemes. Similar to a ramp-up phase we will spend the entire 100,000 EUR raised in blood capital to ensure for the first six months 50% of cumulated expenses to develop the platform, start the website and first promotion and prepare the commissioning of the lighthouse project. In the first year, the company will spend 201,100 EUR mainly for developing the platform in addition to forecasted expenses outlined in fig. 32. By the end of the 6-month period, we will have to actively secure the investments required as in the first year of operation the company will still generate losses of 189,506 EUR. However, in year two of operation we will generate 57,340 EUR EBIT, respectively 47,018 EUR profit with five employees.

PRO FORMA INCOME STATEMENT	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues (1)	21,594.00 €	631,956.00 €	1,281,348.00 €	2,645,748.00 €	4,586,748.00 €
(COGS) Cost of Goods Sold (2)	10,000.00 €	205,000.00 €	620,000.00 €	891,666.67 €	1,416,666.67 €
Gross Profit	**11,594.00 €**	**426,956.00 €**	**661,348.00 €**	**1,754,081.33 €**	**3,170,081.33 €**
Gross Margin %	54%	68%	52%	66%	69%
Payroll (3)	70,000.00 €	175,000.00 €	270,000.00 €	335,000.00 €	500,000.00 €
Fringe benefits (4)	- €	- €	48,000.00 €	48,000.00 €	48,000.00 €
Travel Expenses	12,000.00 €	20,000.00 €	45,000.00 €	70,000.00 €	70,000.00 €
Rent	6,600.00 €	6,996.00 €	7,415.76 €	7,860.71 €	8,332.35 €
Insurance	3,000.00 €	3,120.00 €	3,244.80 €	3,374.59 €	3,509.58 €
Communication Services	3,000.00 €	4,000.00 €	4,000.00 €	4,000.00 €	4,000.00 €
Accounting	2,500.00 €	2,500.00 €	2,500.00 €	2,500.00 €	2,500.00 €
R&D Expenses (5)	70,000.00 €	50,000.00 €	50,000.00 €	50,000.00 €	50,000.00 €
Platform Operations (6)	12,000.00 €	36,000.00 €	36,000.00 €	72,000.00 €	72,000.00 €
Advertising and Promotion	20,000.00 €	40,000.00 €	60,000.00 €	140,000.00 €	250,000.00 €
Operations (Delivery, Logistics, Packaging) (7)	2,000.00 €	32,000.00 €	46,000.00 €	50,000.00 €	50,000.00 €
Total Operating Expenses	**201,100.00 €**	**369,616.00 €**	**572,160.56 €**	**782,735.30 €**	**1,058,341.92 €**
EBITDA	**-189,506.00 €**	**57,340.00 €**	**89,187.44 €**	**971,346.04 €**	**2,111,739.41 €**
Depreciation (8)	- €	- €	- €	- €	- €
EBIT	**-189,506.00 €**	**57,340.00 €**	**89,187.44 €**	**971,346.04 €**	**2,111,739.41 €**
Taxes @18%	**-**	**10,321.20 €**	**16,053.74 €**	**174,842.29 €**	**380,113.09 €**
Net Profit	**-189,506.00 €**	**47,018.80 €**	**73,133.70 €**	**796,503.75 €**	**1,731,626.32 €**

(1) 3,500 x 6 (months) + .99 x 100 App user x 6 (months) = 21,594 EUR
(2) 1,666 x 6 (months) = 10,000 EUR
(3) 70k EUR / 2 Employees
(4) Private Health care/ Company Car etc.
(5) Expenses required to calibrate the platform and hosting
(6) Estimated Hosting Costs for the IOT Platform and licenses
(7) Initial estimations, services will be outsourced

Table 7: Pro forma Income Statement Y1 to Y5 (by the author)

FIRST YEAR INCOME STATEMENT	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Revenues (1)	1.00 €	1.00 €	1.00 €	1.00 €	1.00 €	1.00 €	3,599.00 €	3,599.00 €	3,599.00 €	3,599.00 €	3,599.00 €	3,599.00 €
(COGS) Cost of Goods Sold (2)	1.00 €	1.00 €	1.00 €	1.00 €	1.00 €	1.00 €	1,666.67 €	1,666.67 €	1,666.67 €	1,666.67 €	1,666.67 €	1,666.67 €
Gross Profit	- €	- €	- €	- €	- €	- €	1,932.33 €	1,932.33 €	1,932.33 €	1,932.33 €	1,932.33 €	1,932.33 €
Gross Margin %	- €	- €	- €	- €	- €	- €	53.69%	53.69%	53.69%	53.69%	53.69%	53.69%
Payroll (3)	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €
Fringe benefits (4)	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €
Travel Expenses (5)	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €	1,000.00 €
Rent (6)	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €	550.00 €
Insurance	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €
Communication Services	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €	250.00 €
Accounting	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €	208.33 €
R&D Expenses (7)	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €	5,833.00 €
Platform Operations	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €	2,000.00 €
Advertising and Promotion (8)	- €	- €	5,000.00 €	- €	- €	5,000.00 €				5,000.00 €		5,000.00 €
Operations (Delivery, Logistics, Packaging)	- €	- €	- €	- €	- €	- €	333.33 €	7,442.50 €	7,442.50 €	7,442.50 €	7,442.50 €	7,442.50 €
Total Operating Expenses	**16,924.33 €**	**16,924.33 €**	**21,924.33 €**	**16,924.33 €**	**16,924.33 €**	**21,924.33 €**	**17,257.67 €**	**24,366.83 €**	**24,366.83 €**	**29,366.83 €**	**24,366.83 €**	**29,366.83 €**
EBITDA	**- 16,924.33 €**	**- 16,924.33 €**	**- 21,924.33 €**	**- 16,924.33 €**	**- 16,924.33 €**	**- 21,924.33 €**	**- 15,325.33 €**	**- 22,434.50 €**	**- 22,434.50 €**	**- 27,434.50 €**	**- 22,434.50 €**	**- 27,434.50 €**
Depreciation	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €
EBIT	**- 16,924.33 €**	**- 16,924.33 €**	**- 21,924.33 €**	**- 16,924.33 €**	**- 16,924.33 €**	**- 21,924.33 €**	**- 15,325.33 €**	**- 22,434.50 €**	**- 22,434.50 €**	**- 27,434.50 €**	**- 22,434.50 €**	**- 27,434.50 €**

1) 3,500 x1 (months) + .99 x 100 App user x 1 (months) = 3,599 EUR
(2) 1,666 x 1 (months) = 1,666 EUR
(3) 5,833 EUR / 2 Employees / Month
(4) Private Health care/ Company Car etc.
(5) Expenses using company car
(6) Office space rent / month
(7) Initial estimations, services will be outsourced
(8) Quarterly Advertising and Promotion Campaigns

Table 8: Pro forma Income Statement Y1 (by the author)

5.4.1 Revenues calculation first five years

In year one we are planning to achieve revenues of 21,594 Euro representing the monthly invoicing for Q3 and Q4 of the lighthouse project. This is due to preexisting supplier agreements to finance the first install. To sum it up 3,500 x 6 (months) + .99 x 100 App user x 6 (months) = 21,595 Euro revenue first year. A full breakdown can be observed in the First Year income statement fig 33. Consequently, as per increasing number of installation, revenue will be generated in accordance to the monthly invoicing stipulated in the pricing section.

5.4.2 Pro forma cash flow statement

At the very beginning, both founders will invest each 50,000 EUR, total 100,000 EUR. This will help us to cover our cost for the first six months. In the first phase, our initial spending will consist of the total amount of 100,000 EUR, with an additional 106, 172 EUR in the first year of operation. As such, we will need to find an investor within the first six months. This will be covered by an investment of 400.000 EUR from our investors. In year two of operation, we achieve a positive 57,340 EUR Net Cash flow with 631,956 EUR revenue respectively a closing balance of 366,834 EUR and assume we do not need another financing round.

CASH FLOW STATEMENT	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Opening balance	500,000	500,000	310,494	367,834	457,021	1,428,367
EBITDA	0	-189,506	57,340	89,187	971,346	2,111,739
Working Capital	0	0	0	0	0	0
CAPEX	0	0	0	0	0	0
CF year	0	-189,506	57,340	89,187	971,346	2,111,739
Closing balance	500,000	310,494	367,834	457,021	1,428,367	3,540,107

Table 9: Summary Cash Flow Statement (own elaboration)

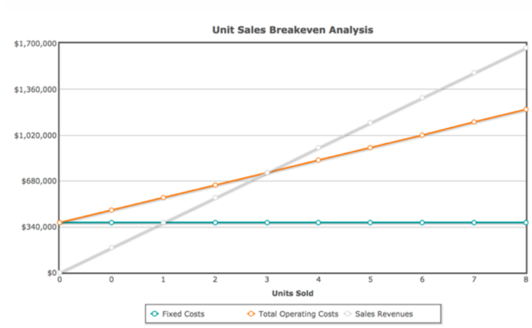


Figure 23: Break Even Analysis (own elaboration)

PRO FORMA CASH FLOW STATEMENT	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash receipts						
Opening balance	0	500,000 €	309,494 €	366,834 €	456,021 €	1,427,367 €
CHANGE IN EQUITY	500000	- €	- €	- €	- €	- €
Sales		21,594 €	631,956 €	1,281,348 €	2,645,748 €	4,586,748 €
WORKING CAPITAL						
Total cash		**21,594 €**	**631,956 €**	**1,281,348 €**	**2,645,748 €**	**4,586,748 €**
Cash disbursements						
Cost of goods sold		10,000 €	205,000 €	620,000 €	891,667 €	1,416,667 €
Payroll		70,000 €	175,000 €	270,000 €	335,000 €	500,000 €
Fringe benefits		- €	- €	48,000 €	48,000 €	48,000 €
Travel Expenses		12,000 €	20,000 €	45,000 €	70,000 €	70,000 €
Rent		6,600 €	6,996 €	7,416 €	7,861 €	8,332 €
Insurance		3,000 €	3,120 €	3,245 €	3,375 €	3,510 €
Communication Services		4,000 €	4,000 €	4,000 €	4,000 €	4,000 €
Accounting		2,500 €	2,500 €	2,500 €	2,500 €	2,500 €
R&D Expenses (2)		70,000 €	50,000 €	50,000 €	50,000 €	50,000 €
Platform Operations		12,000 €	36,000 €	36,000 €	72,000 €	72,000 €
Advertising and Promotion		20,000 €	40,000 €	60,000 €	140,000 €	250,000 €
Operations (Delivery, Logistics, Packaging) (3)		2,000 €	32,000 €	46,000 €	50,000 €	50,000 €
Total cash disbursements		**212,100 €**	**574,616 €**	**1,192,161 €**	**1,674,402 €**	**2,475,009 €**
Net cash flow		-190,506 €	57,340 €	89,187 €	971,346 €	2,111,739 €
Closing balance	500000	309,494 €	366,834 €	456,021 €	1,427,367 €	3,539,107 €

Table 10: Pro forma Cash Flow Statement (by the author)

PRO FORMA BALANCE SHEET	Start	Year 1	Year 2	Year 3	Year 4	Year 5
Current Assets						
Cash	500,000 €	309,494 €	366,834 €	456,021 €	1,427,367 €	3,539,107 €
Accounts Receivable		- €	- €	- €	- €	- €
Total Assets	**500,000 €**	**309,494 €**	**366,834 €**	**456,021 €**	**1,427,367 €**	**3,539,107 €**
Liabilities & Equity						
Equity						
Owners' equity	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €	100,000 €
Investors equity	400,000 €	400,000 €	400,000 €	400,000 €	400,000 €	400,000 €
Profit actual year	- €	-189,506 €	47,019 €	73,134 €	796,504 €	1,731,626 €
Cumulated profit			-189,506 €	-142,487 €	-69,353 €	727,150 €
Total Equity	**500,000 €**	**310,494 €**	**357,513 €**	**430,647 €**	**1,227,150 €**	**2,958,777 €**
Total Equity and Liabilities	**500,000 €**	**310,494 €**	**357,513 €**	**430,647 €**	**1,227,150 €**	**2,958,777 €**
		-1,000 €	9,321 €	25,375 €	200,217 €	580,330 €

Table 11: Pro Forma Balance Sheet (by the author)

5.4.3 Break-even analysis

Smart Marina plans to accomplish break even in year two of operation. Break-even will be reached by the 3rd installation, based on our cost structure as well as we are ensuring the sales plan of 16 systems per Y2.

5.4.4 Financial source and application of funds statement

To finance the venture, the founders will invest 100,000 EUR. Also, we are planning to sell company shares to investors from the beginning. In total, we will sell 20 % of the company shares and plan to receive 400.000 EUR in return.

5.4.5 `Needed Resources

Hardware

Office space for approx. 8 people Purchase office furniture as well as computers for all employees. Additionally, we would require servers to run the platform and APP as well as high performant web space.

Software

Key Intellectual Resources: The smartmarina.com or similar domain will have to be acquired and a pre-developed IOT Platform (IBM Watson) license and obtain copyright for our brand. Furthermore, we need web/application developing software as well a direct support center for customers, potentially considering outsourcing via an external provider.

At the same time, we will need to establish our customer databases, starting with our own connections with a future consideration to employ sales people bringing additional contact and industry know-how.

5.5 Organization plan

In terms of organization we find essential to build the company culture on shared norms and values, driven from its inception by the company's CEO and adopted by the other shareholders.

5.5.1 Form of ownership

In terms of shares, both founders shall be equal, at the same time welcoming investors that can sustain the company not only financially but especially through their network, engineering resources and client contacts. With that in mind, we will sell 20% of our company in order to gain investors and required complementary assets to start-up our business. By doing so, this particular shareholder structure will insure the needed flexibility to avoid a second financing round which will not be required.

5.5.2 Identification of partners and/or principal shareholders

OEM Manufactures (e.g. ABB, Ciel et Terre, Aeolos, Hybrid):

OEM Manufacturers are crucial to start-up our business. By partnering up, we can guarantee better pricing deals for top of the line equipment used in our projects, but we are also able to contract business.

The Blue Flag Initiative

Through a strategic partnership with the Blue Flag initiative, a world renowned eco-label in alignment with environmental management standards, our company will work together with our clients to reinforce their commitment to the environment and a sustainable future utilizing renewable energy sources in their daily operation. The initiative shares our common environmentally conscious vision and can provide access to a vast array of potential customers via their 4266 Beaches, Marinas and Eco-tourist sites in 47 countries.

5.5.3 Organizational structure

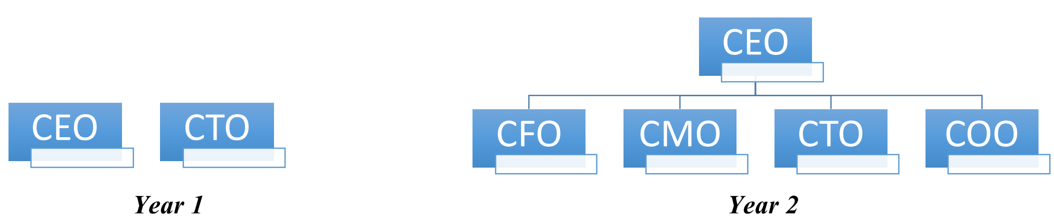


Figure 24: Organizational structure Y1-Y2 (own elaboration)

5.5.4 Roles and responsibilities of members of organization

- The CEO (founder/idea visionary) – Will bear responsibility for P&L of the entire company. Additionally, perform hiring, office space rental and serves as the face of the business while understanding and executing the business idea efficiently.

- The CTO (product founder/technology visionary) – Bears responsibility to set up the platform and ensure the efficient and smooth running of all business processes. Additionally, he understands the technology and product and its application.
- The CMO (marketing visionary) – Bears responsibility for marketing to marina operators, branding and reputation understanding the market and customer demand.
- The CFO – Responsible for all tax and financial issues
- The COO – Bears responsibility over all business processes (succeeds the CTO)

5.5.5 The management team background

The most critical aspect of building the team is a shared vision and values as they will be working together for a number of years. What we aim for is to have a team with complementary backgrounds and skill as well as ensuring the alignment of their goals with the ones of the founders.

5.6 Operational plan

The first step is to found the venture Smart Marina d.o.o. Secondly, we will develop the technical and marketing concepts as well as signing contracts with partners. Furthermore, during this time, our terms and conditions will also be developed. As soon as the above documentation is in order, we aim at pressing our business plan to investors. Our expectancy is that we will need around one month for investors to reach a decision with an additional month to conclude all contract signing. Our plan is it to have the first pilot project commissioned after six months with a commissioning target for Q3 of the first year.

5.6.1 Description of the company’s operation

Setting up the business: Develop the platform

In the first Q1, we will form the team and company and begin immediately to develop the Hardware and Software bundles while at the same time prepare the documentation to explore bootstrapping option such as HBOR, Environmental Loans or H2020 funding. During this period the first digital marketing and promotion campaign will be deployed to raise awareness via the website to our clients. Furthermore, the digital platform and APP will be fully developed by this time. Also, the technical and concepts will be finalized along with completing the terms and conditions in our contracts.

Sign 1st customer for pilot project and MOU

Beginning of Q2 our company aims at signing the first pilot project or MOU with our first customer ACI Marinas. Ideally, the system installation will be commissioned throughout Q2 entering in operation beginning of Q3. At the same time, the digital platform and APP will be rolled out with a complete technical and commercial concept.

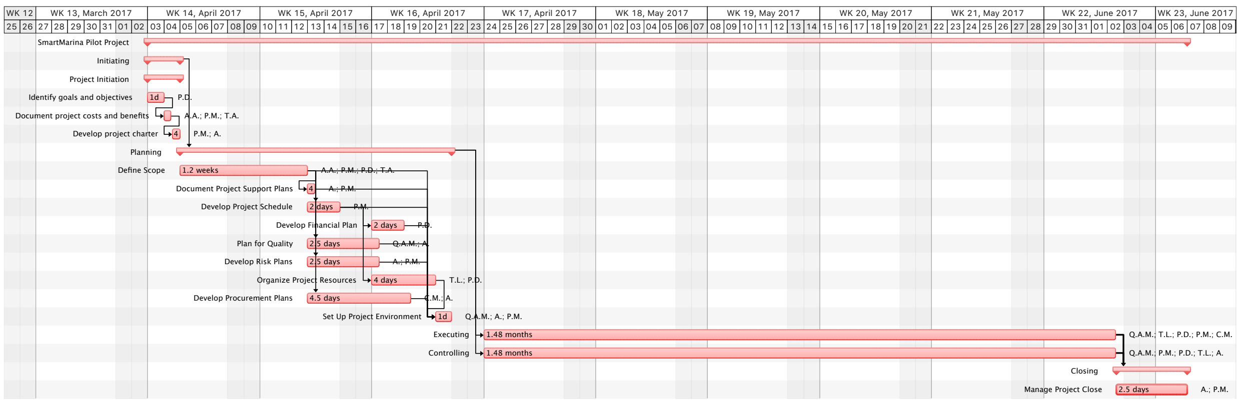


Figure 25: Smart Marina Pilot Project Management Plan – Retracted view (by the author)

Concerning the operational aspects of the installations, we are aiming at establishing a project template as observed in fig. 25 and detailed view in Appendix C that can be adjusted on a case to case basis depending on project particularities, however, maintain an average of no more than nine weeks from start to close. Each project will follow the above framework and cross the classic stages of Initializing, Planning, Executing, Controlling and Closing. Within these stages, specific activities and deliverables were designed to match all project requirements respectively quality. For the pilot project, the PM role will be carried out by the CTO, with such function outsourced per each future project under the direct coordination of the COO.

Develop partnership with manufacturers

We will develop and maintain our relationship with manufacturers such as ABB, GE, Siemens, Ciel et Terre, IBM and Aeolos to ensure pricing on commissioned equipment and full support with future installs as well as making sure stock is available within the desired time frame. Furthermore, each system component will require maintenance and technical support thus a stable relationship with the OEM is extremely important for our business.

Promote the platform to customers

We will begin promoting our solution the first year mainly building a strong online presence via the website and social media with efficient targeting due to the small number of marinas making it extremely manageable to contact the customer directly. Mainly in the first six months, we will promote the company and solution, with the remaining 6 showcasing the pilot project. We will invest 5,000 EUR every three months and roll targeted digital media campaigns each quarter. Starting with Y2, once our CMO comes on board, we will re-address the marketing plan and allocate a much larger budget for promotional activities.

To develop customer partnerships

Our aim is developing and maintaining customer relationships through transparency, improved service and smaller costs that will shape the client's positive perceptions concerning the service quality and consolidating our brand. This hopefully will increase the level of our relationship with clients enabling us to create partnerships in our mutual benefit. Furthermore, we will actively promote our current installs creating additional exposure for our clients.

Marketing and Sales

During the first year, the CEO will conduct all sales and marketing activities with the objective of negotiating a multiple install agreement with the lead customer within Q4. Starting with Q1 year two, the CEO will sign the ten installation contract with a projected installation deployment in Q2 and together with the CMO will establish the install base via a market turnkey solution. The projected sales plan is to sign six new systems and develop operations in Montenegro and Italy with project deployment in Q3 of year 2. Furthermore, in Q4 the aim is to sign another multiple install deal with lead customer #2.

Invoicing

Customers Invoices will be issued monthly at the convened contractual date by the existing contract.

Quality control

Regarding quality control, as observed in the detail project management plan in Appendix C, in the planning phase, we have drafted the special provision to plan for quality by defining quality requirements, setting up standards and procedures for quality management, all included in the quality management plan documentation of each project. Furthermore, in the next phase of "executing" specific quality assurance activities have been allocated such as participate in walk-throughs and reviews, conduct inspections and site audits, participate in testing and conduct project reviews. Lastly, in the "controlling" phase, quality control is provisioned as an on-going activity to ensure quality standards are met.

Platform and mobile app maintenance

Considered one of our critical business activities for our company, we consider ourselves not a cost driven but value driven business. This is due to focusing and prioritizing to deliver excellent service with the satisfaction of our customers being a vital component in the growth of our business. Doing so, perfectly integrated key resources will secure the successful achievement of our job enabling us to expand our customer list.

5.7 SWOT Analysis

5.7.1 Internal dimension

INTERNAL DIMENSION		
	STRENGTHS	**WEAKNESSES**
Roots of competitive advantage	**RESOURCES** • Strong relationship with potential customers, suppliers, and partners. **CAPABILITIES** • Strategic approach to the whole market of marinas in Croatia, targeting a particular market segment Focus on short and long term advantages **COMPETENCIES** • First smart grid platform for marina operators Innovative solution integration and turn-key supplier (all-in-one solution) • System architecture comprised of best market available technologies, own choice of suppliers • Custom specialized services integration (feeds) • Innovative integration platform and APP	**RESOURCES** • Small customer base, scaling up is challenging • High investment required • Need to establish brand • Challenging resource allocation (limits of op. lean) **CAPABILITIES** • Lean operation in first year CEO, CTO • Limited R&D Budget • Limited Sales Force **COMPETENCIES** • Multiple technology integrations • High dependency on pilot project • Reliance on efficient technology integration
Competitive advantage, value creation, and	**VALUE CUSTOMERS PUT IN PRODUCT** • Constant system and service quality for RES power generation • High performance of energy and service management system for MNP's • Large Product/Services range and degree of customization	**DELIVERING VALUE AND PROFITABILITY** • Value creation is dependent on multiple non-proprietary technologies integration and operation with a high technological complexity • Certain elements of technical support are dependent on supplier support and schedule **COSTS**

	• Digital ecosystem and data hub innovation performance to drive sales and marketing • Improved asset environmental performance, compliance with standards to achieve zero emission marina • Excellent user experience and control **PRICE CHARGED** • Full capital payout lease in 5yr with a monthly fee which • Energetic value is 85% of the monthly fee. **COSTS** • Project-based work allowing for a better cost control and reduced interdependency between installs • Transparency in cost and quality	• High investment required to build new brand • Dependent on financing from suppliers or market support schemes to ensure low costs and profitability • Certain degree of project customization of higher project costs
Value Chain	**PRIMARY ACTIVITIES** • Customer support and customer satisfaction • Inbound logistics performance assured by effective project management respectively outbound to be outsourced • Marketing and sales activity, lead customer **SUPPORT ACTIVITIES** Human Resources – full commitment Infrastructure Specific engineering know-how with direct application on niche market	N/A
Building Block of competitive advantage	**EFFICIENCY** • Ensuring entire system and operations efficiency to deliver value to the client. Efficiency provided through on-going live platform maintenance and monitoring **QUALITY** • Constant quality checks both pre and post install. Compliance with ISO standards and current quality and environmental system upgrades. • Constant client reviews and systematic quality reporting **INNOVATION** • Unique product in the market • Technology Intensive, innovative solution • Site and segment specific (MNP's)	**CUSTOMER RESPONSE** • Existing customer resistance to innovation • Difficulties understanding the solution • Brand recognition • Potential unavailability of investment capital **BARRIERS TO IMITATION** • Rather low barriers to imitation, therefore new entrants might appear in the market **INDUSTRY DYNAMISM** • Existing system components are already implemented (IT, Energy management systems)

Table 12: SWOT Analysis – Internal Dimension (by the author)

5.7.2 External dimension

EXTERNAL DIMENSION		
	OPPORTUNITIES	**THREATS**
Industry Overview		

Risk of Entry by potential competitors	**ABSOLUTE COST ADVANTAGES** • Unlike manufacturers, our business model has absolute cost advantages as we utilize financing agreements with our suppliers as we are required by the project scope • Equipment is contracted project based and using economies of scale we can negotiate **POTENTIAL EXIT STRATEGIES** • With risk of entry by potential competitors, our strategy is to build our company and brand and target an acquisition by the larger players such as OEM's or large energy companies	**BRAND LOYALTY/RECOGNITION** • Customer is loyal to renowned manufacturers or large service providers such as national energy companies, therefore, we need to build and maintain a powerful brand emphasizing our absolute focus on MNP operations **POTENTIAL COMPETITORS** • Moderate to high risk of entry by potential competitors due to existing capabilities detailed in the competitor analysis at page x
Rivalry among established companies	**CUSTOMER AND INDUSTRY DEMAND** • Industry demand towards smart-grid integration, energy management systems and IOT technologies • Customer demand for upgrading quality and environmental systems driving competitive advantage through sustainable development • Industry and customer demand for clean energy from RES integrated into their operations. • Lack of commercial and industrial application	**INDUSTRY COMPETITIVE STRUCTURE** • Multiple potentials and future competitors such as OEM's, domestic RES system suppliers and large energy companies. • Industrial and commercial segments will be the primary target, red ocean strategy
Bargaining power of Buyers	• Relatively low as the effect on pricing is not strong due to the product not having excess suppliers due to first mover advantage and having a collective voice in first years.	• Some customers might include site-specific conditions as a pre-requisite for install as well as special terms and conditions • Could experience a shift in bargaining power of buyers due to lead customer targeting and multiple installs target (substantial purchases)
Bargaining power of Suppliers	• OEM's have high bargaining power due to reliance on their product for critical system components • Forward integration of suppliers • Market demand is not large enough to create and advantage for suppliers (few goods, many buyers)	• OEM's can increase pricing and delivery times for system components if they become potential competitors • Suppliers can demand premium pricing • Higher costs to switching suppliers
Threat of substitutes	• In the case of a beneficial arrangement with each manufacturer, the threat of substitution can be moderate due to first mover advantage.	• Potential customers can substitute individual system components without the integration at lower costs
MACROECONOMIC ENVIRONMENT		

	MACROECONOMIC FORCES • Variety of support schemes at national and European level on RES targets (market pull policies) • Growing market for marine electric vehicles • Disruptive threat to utility business models **TECHNOLOGICAL FORCES** • Technology push-policies under the environmental protection fund fostering innovation • Rise of disruptive technologies such (smart grids) and shift away from main grid • Rise in new grid investments on distribution automation, transmission modernization, network operations software and grid analytics • Emergent focus from individual energy devices and analytics towards total integration and mastering of the operating system of all internet of things (IOT) devices in industrial and commercial sites **DEMAND CENTRIC FORCES** • Emergence of "quality" and "environmentally friendly policies" as main valuation tools to estimate actual demand and provide a competitive advantage	**MACROECONOMIC FORCES** • On-going changing legislation (Croatia) / long-term period of adopting bylaws for auctions • Market caps **TECHNOLOGICAL FORCES** • Significant technological developments within the 5y contract range • Slow development of common integration standards

Table 13: SWOT Analysis – External Dimension (by the author)

6. Conclusions, discussions and key observations

Addressing the objectives of the master thesis, one can conclude that market pull and technologies push policies are pivotal in creating an environment fostering RES regulation-induced innovation, in which companies can exercise a first-mover advantage in target markets such as Croatia.

With the more growing demand for quality and environmental management and monitoring for sustainable development as differentiators and leading valuation tools to estimate demand and competitive advantage among marina operators, it has become a necessity to introduce novel techniques and practice meant to increase safety and protect the environment.

Envisioned as the next phase of sustainable development for marina operators, the concept of zero emissions marina, powered mainly by RES to fulfill power requirements is built on the foundation of ISO standards implementation, implicitly an effective environmental management system. Taking into account advancement requirements, one can conclude that the integration of RES and related novel technologies represents the only viable course of action.

An in-depth look at the current status, drivers of smart grid disruptive technologies pictures a shifting future focus from individual energy devices and analytics towards the total integration and mastering the operating system of all internet of things (IOT) devices inside industrial and commercial sites, with the energy grid showcasing big data analytical capabilities.

At the same time, the rise of IOT and CPS Technologies is a predominant theme in all current literature with applications such as an intelligent greenhouse, intelligent transportation systems, power distribution grid, smart home, smart building and smart city.

Disruptive technologies and forces, enabled by transformative industry trends have spearheaded the profitability and use of DG and energy management technology to ultimately challenging the traditional business model for utilities.

In a future in which utility companies lose touch with the customers, other players are taking control of the client's energy hub, as the focus shifts from the main grid towards on-site generation and storage and DG via micro-grids, which in turn, induces a paradigm shift from consumer to prosumer.

With an increasing number of providers developing energy services to sustain such needs of commercial and industrial customers requiring RES integration for onsite power, demand management, and energy efficiency, we can observe the rise of solution integrators providing turn-key solutions by incorporating key attributes in one capability deck.

Driving sustainable development through the integration of three main elements: Hybrid RES distribution systems, energy management software and IOT Platform, turn-key solution integrators such as Smart Marina are emerging to establish an efficient methodology for such vehicles to provide a viable venture with a strong emphasis on customer preferred product attributes.

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Appendix

Appendix A

Survey in English

Dear Sir/Madam,

I would kindly like to ask you to participate in a short questionnaire that will include all licensed marina operators in Croatia, as part of my MBA Thesis with Vienna University of Economics.

The aim of this survey is to assess the importance of product features for a newly proposed concept - Smart Marina, which focuses on the integration of Renewable Energy Sources into the environmental programs of marina operators in Croatia, as a next step into achieving sustainable development and zero-emission marinas and nautical ports (MNP's) aligned with global trends.

The concept combining a RES-powered micro grid, energy management system and an IoT Platform provides a competitive advantage, lower costs, optimize operations and utilities consumption, while enhancing the customer experience through a digital ecosystem and APP-integrated business services.

Your input will remain strictly confidential, only to be used as a set of statistics for statistical processing. Please take some time and provide your honest input to answer all the questions.

Thank you,
Mircea Preda
Vienna University of Economics and Business, MBA

1. **What's the current state concerning such technologies in your organization?**

At the moment do you integrate any renewable energy power sources (wind, solar or hydro) in your operations?

YES	NO

If yes, could you please state which type and capacity? (Solar, Wind, kw)

Solar	Wind	Hidro

Less than 10kw	Between 10kw and 30kw	Between 30kw and 60kw	Over 60kw

If no, have you considered it based on your needs or as a part of your environmental management system?

YES	NO

1. **If you had the opportunity to experience the lighthouse project and integrate the Smart Marina Concept in your your operations, how would you react to the following product features:**

Functional

1. The system provides an added power capacity of 60kW from renewable energy sources.

I would like this	It's implied	I'm indecisive	I do not like it

2. he energy cast platform allows optimal utilities consumption and provides enhanced energy management and control

I would like this	It's implied	I'm indecisive	I do not like it

3. The system will give you the ability to expand/establish marina operations on off-grid remote locations (islets).

I would like this	It's implied	I'm indecisive	I do not like it

4. You will benefit from a centralized marina management system and all-in-one control dashboard.

I would like this	It's implied	I'm indecisive	I do not like it

5. The marina will foster a data hub, cloud and digital ecosystem to include analytics of system and consumer data.

I would like this	It's implied	I'm indecisive	I do not like it

6. You would be able to have direct client communication via App with additional options such as booking and integrated business services (own services and additional channel to market for suppliers)

I would like this	It’s implied	I'm indecisive	I do not like it

7. The app will integrate feeds from berth charging, marina sensor grid, ultrasound, meteorological, water quality and wave measurement

I would like this	It’s implied	I'm indecisive	I do not like it

Disfunctional

1. The system does not provide an added power capacity of 60kW from RES.

I would like this	It’s implied	I'm indecisive	I do not like it

2. You will not have the ability to consider expanding (new establishment) operations on off-grid locations. (islets)

I would like this	It’s implied	I'm indecisive	I do not like it

3. The platform limits the optimization of utilities consumption and does not provide energy management and control tools.

I would like this	It’s implied	I'm indecisive	I do not like it

4. The marina management system is not centralized and does not have an all-in-one control dashboard.

I would like this	It’s implied	I'm indecisive	I do not like it

5. The marina does not foster a data hub, cloud and digital ecosystem and system and consumer analytics are not available.

I would like this	It’s implied	I'm indecisive	I do not like it

6. Unavailable direct client communication via App with additional options such as booking and integrated business services (own services and additional channel to market for suppliers)

I would like this	It’s implied	I'm indecisive	I do not like it

7. No available live feeds via APP to customers from berth charging, marina sensor grid, ultrasound, meteorological, water quality and wave measurement.

I would like this	It’s implied	I'm indecisive	I do not like it

Survey in Croatian

Poštovana/i,

Slobodan sam Vas zamoliti za sudjelovanje i suradnju u ispunjavanju upitnika koji će se uputiti svim licenciranim marina operaterima u Hrvatskoj, kao dio novog koncept projekta *SmartMarina* koji osobno vodim kao Business Development Director za kompaniju Adrem Engineering iz Rumunjske.
Radi se o upitniku za čije ispunjavanje je potrebno oko 5 minuta.

Cilj ovog upitnika je procijeniti važnost karakteristika proizvoda za novi predloženi koncept- *SmartMarina.* Koncept je fokusiran na integraciju obnovljivih izvora energija u program zaštite okoliša operatora marina u Hrvatskoj, a u svrhu postizanja održivog razvoja i nulte emisije marina i nautičkih luka i u koraku s globalnim trendovima.

Koncept povezuje mikro mrežu s obnovljivim izvorima energije napajanja, sustavom upravljanja energijom i IoT («Internet of things») sustavom te tako dovodi do konkurentske prednosti, nižih troškova, optimizacije operacija i potrošnje komunalnih usluga, a istodobno povećavajući iskustvo korisnika kroz digitalni ekosustav i poslovne usluge integrirane u aplikacije.

Vaši odgovori će ostati strogo povjerljivi, te će se koristi jedino kao skup podataka za statističku obradu.
Rado ću, ukoliko pokažete zainteresiranost, s Vama podijeliti rezultate ankete.
Molim Vas odvojite malo vremena i dajte svoj iskreni odgovor na sva pitanja.
Hvala.
S poštovanjem,
Mircea Preda
Business Development Director, Adrem Engineering

1. Kakva je trenutna situacija u korištenju ovakvih tehnologija u vašoj organizaciji?

Da li trenutno integrirate neki od obnovljivih izvora energije (vjetar, solarnu energiju ili vodu) u svoje poslovanje?

DA	NE

Ako da, možete li navesti vrstu i kapacitet? (solarni, vjetar, vodu, kw)

Solarni	Vjetar	Hidro

Manje od 10kw	Između 10kw i 30kw	Između 30kw i 60kw	Preko 60kw

Ako ne, jeste li ga razmotrili kao dio vaših potreba ili kao dio svog sustava upravljanja okolišem?

DA	NE

2. **Da imate priliku iskusiti *lighthouse* ("svjetionik") projekt i integrirani SmartMarina koncept u svojim poslovnim operacijama, kako biste reagirali na sljedeće značajke proizvoda:**

FUNKCIONALNA PITANJA

8. Sustav pruža dodatni kapacitet snage od 60 kW dobiven od obnovljivih izvora energije.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

9. Energetska platforma omogućuje optimalnu potrošnju komunalnih usluga i omogućuje poboljšano upravljanje i kontrolu energije.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

10. Sustav će vam pružiti mogućnost proširenja / uspostave operacija marine na izvanmrežnim udaljenim lokacijama (otocima).

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

11. Imat ćete koristi od centraliziranog sustava upravljanja marinama i sveobuhvatne nadzorne ploče.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

12. Marina će podržavati podatkovni čvor, *cloud* i digitalni ekosustav kako bi omogućio analizu podataka o sustavu i potrošaču.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

13. Imat ćete izravnu komunikaciju s klijentom putem aplikacije s dodatnim opcijama kao što su rezervacije i integrirane poslovne usluge (vlastite usluge i dodatni kanal za tržište za dobavljače).

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

14. Aplikacija će integrirati *feedove* s punjenja vezova, mrežom senzora, ultrazvukom, meteorologijom, kvalitetom vode i mjerenjem valova.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

DISFUNCIONALNA PITANJA

1. Sustav ne pruža dodatni kapacitet snage od 60 kW dobiven od obnovljivih izvora energije.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

2. Nećete imati mogućnost razmotriti proširenja (novo uspostavljenih) operacija na mjestima izvan mreže (otoci).

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

3. Platforma ograničava optimizaciju potrošnje komunalnih usluga i ne pruža alate za upravljanje i kontrolom energije.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

4. Sustav upravljanja marinama nije centraliziran i nema nadzornu ploču sve-u-jednom *("all in one dashboard")*.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

5. Marina ne njeguje podatkovno čvorište ("*data hub")*, *cloud* i digitalni ekosustav, te analize sustava i potrošača nisu dostupne.

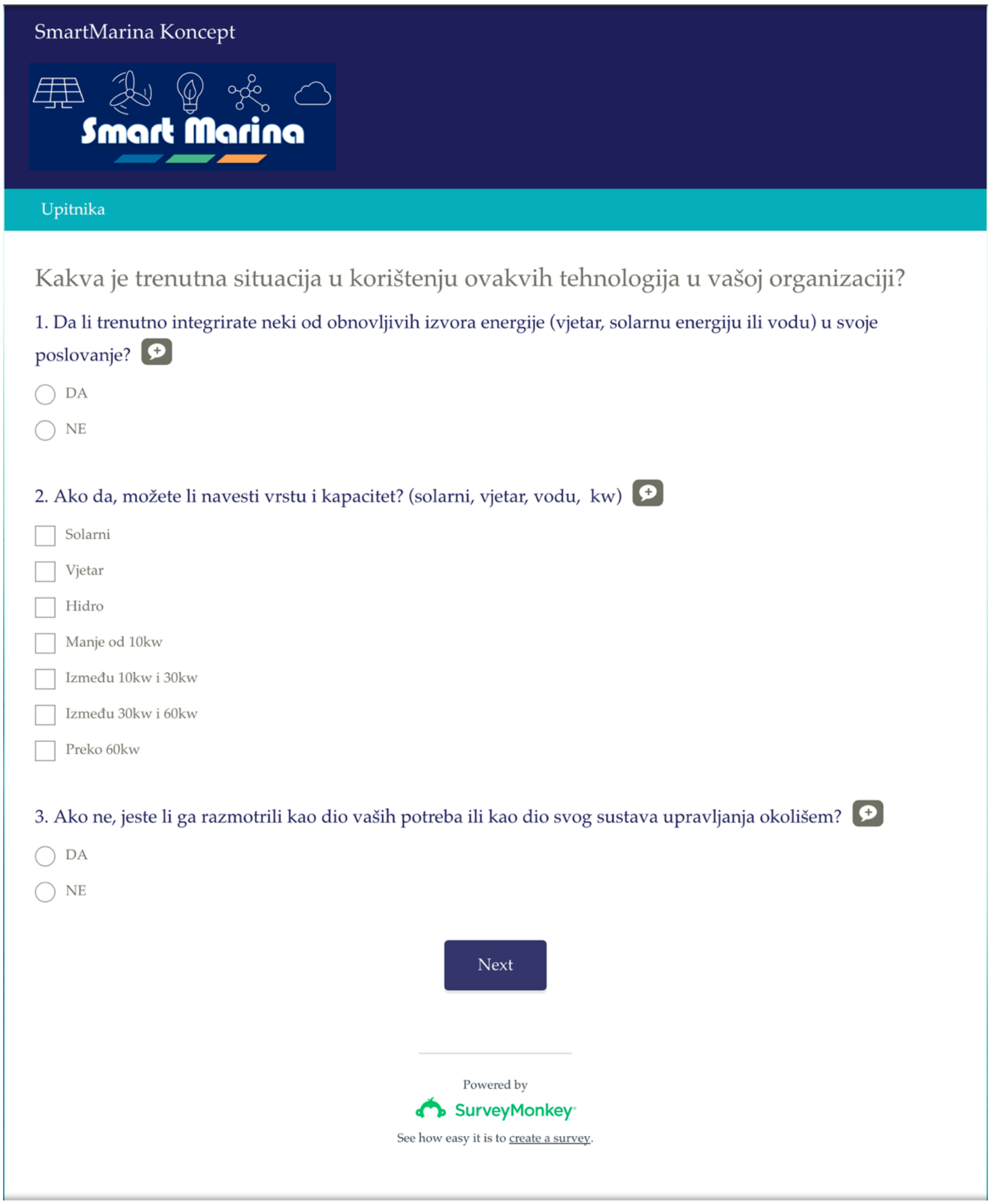
Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

6. Nemogućnost uspostavljanja izravne komunikacije s klijentima preko aplikacije (App) koja sadrži i dodatne mogućnosti korištenja poput rezervacije (*booking*) i integriranih poslovnih usluga (npr. vaših vlastitih usluge i usluga ostalih dobavljača).

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**

7. Nemogućnost ostvarivanja komunikacije putem *feedova* uživo preko APP-a s korisnicima koji u realnom vremenu primaju informacije koje se tiču punjenja brodova na sidrištu, mreže senzora marina, ultrazvuka, meteorologije, kvalitete vode i mjerenja valova.

Sviđa mi se	**Podrazumijeva se**	**Ravnodušan sam**	**Ne sviđa mi se**


SmartMarina Koncept

Smart Marina

Upitnika

Kakva je trenutna situacija u korištenju ovakvih tehnologija u vašoj organizaciji?

1. Da li trenutno integrirate neki od obnovljivih izvora energije (vjetar, solarnu energiju ili vodu) u svoje poslovanje?

- DA
- NE

2. Ako da, možete li navesti vrstu i kapacitet? (solarni, vjetar, vodu, kw)

- Solarni
- Vjetar
- Hidro
- Manje od 10kw
- Između 10kw i 30kw
- Između 30kw i 60kw
- Preko 60kw

3. Ako ne, jeste li ga razmotrili kao dio vaših potreba ili kao dio svog sustava upravljanja okolišem?

- DA
- NE

Next

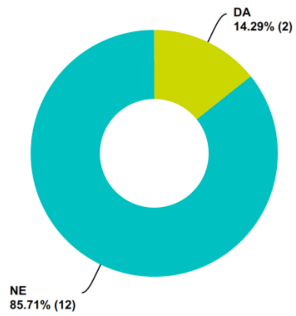
Powered by SurveyMonkey

See how easy it is to create a survey.

Appendix B

Q1 Da li trenutno integrirate neki od obnovljivih izvora energije (vjetar, solarnu energiju ili vodu) u svoje poslovanje?

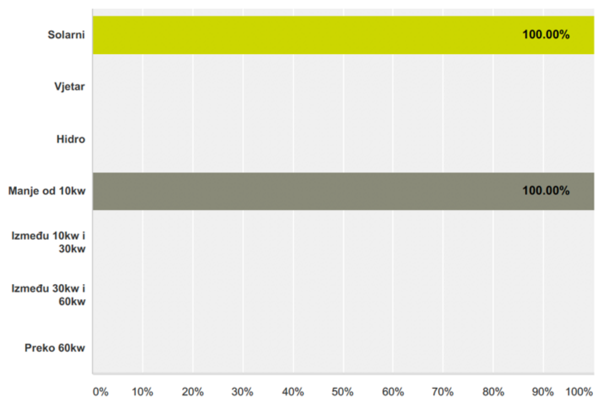
Answered: 14 Skipped: 0



Answer Choices	Responses	
DA	14.29%	2
NE	85.71%	12
Total		14

Q2 Ako da, možete li navesti vrstu i kapacitet? (solarni, vjetar, vodu, kw)

Answered: 2 Skipped: 12

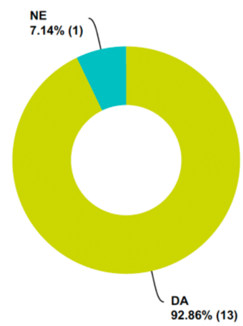


Answer Choices	Responses	
Solarni	100.00%	2
Vjetar	0.00%	0
Hidro	0.00%	0
Manje od 10kw	100.00%	2
Između 10kw i 30kw	0.00%	0
Između 30kw i 60kw	0.00%	0
Preko 60kw	0.00%	0
Total Respondents: 2		

SmartMarina Koncept SurveyMonkey

Q3 Ako ne, jeste li ga razmotrili kao dio vaših potreba ili kao dio svog sustava upravljanja okolišem?

Answered: 14 Skipped: 0

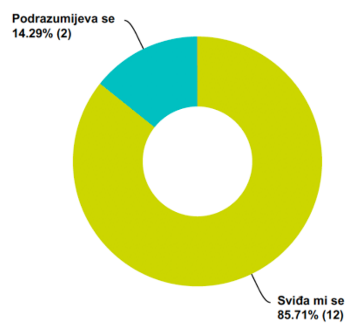


Answer Choices	Responses	
DA	92.86%	13
NE	7.14%	1
Total		14

SmartMarina Koncept SurveyMonkey

Q4 Sustav pruža dodatni kapacitet snage od 60 kW dobiven od obnovljivih izvora energije.

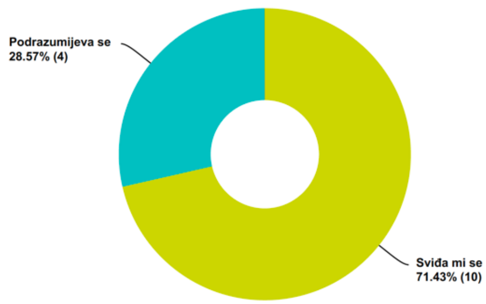
Answered: 14 Skipped: 0



Answer Choices	Responses	
Sviđa mi se	85.71%	12
Podrazumijeva se	14.29%	2
Ravnodušan sam	0.00%	0
Ne sviđa mi se	0.00%	0
Total		14

Q5 Energetska platforma omogućuje optimalnu potrošnju komunalnih usluga i omogućuje poboljšano upravljanje i kontrolu energije.

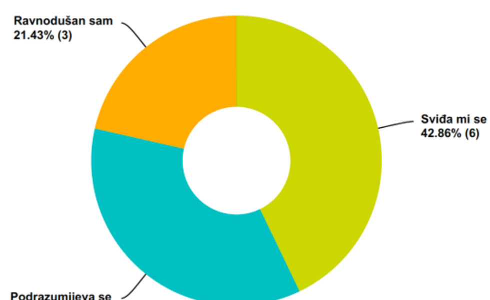
Answered: 14 Skipped: 0



Answer Choices	Responses	
Sviđa mi se	71.43%	10
Podrazumijeva se	28.57%	4
Ravnodušan sam	0.00%	0
Ne sviđa mi se	0.00%	0
Total		14

Q6 Sustav će vam pružiti mogućnost proširenja / uspostave operacija marine na izvanmrežnim udaljenim lokacijama (otocima).

Answered: 14 Skipped: 0

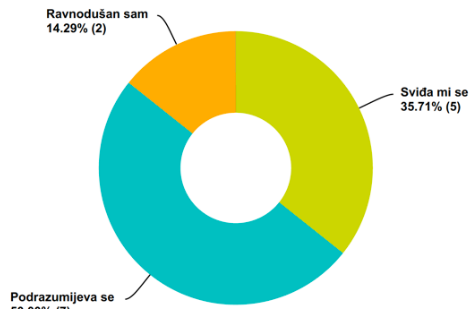


Answer Choices	Responses	
Sviđa mi se	42.86%	6
Podrazumijeva se	35.71%	5
Ravnodušan sam	21.43%	3
Ne sviđa mi se	0.00%	0
Total		14

SmartMarina Koncept SurveyMonkey

Q7 Imat ćete koristi od centraliziranog sustava upravljanja marinama i sveobuhvatne nadzorne ploče.

Answered: 14 Skipped: 0

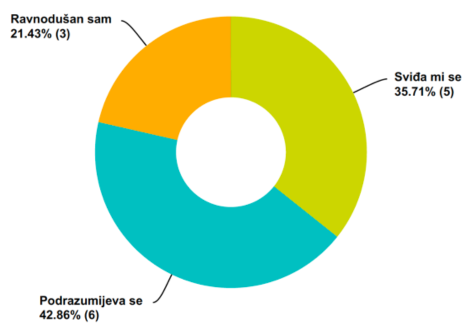


Answer Choices	Responses	
Sviđa mi se	35.71%	5
Podrazumijeva se	50.00%	7
Ravnodušan sam	14.29%	2
Ne sviđa mi se	0.00%	0
Total		14

SmartMarina Koncept SurveyMonkey

Q8 Marina će podržavati podatkovni čvor, cloud i digitalni ekosustav kako bi omogućio analizu podataka o sustavu i potrošaču.

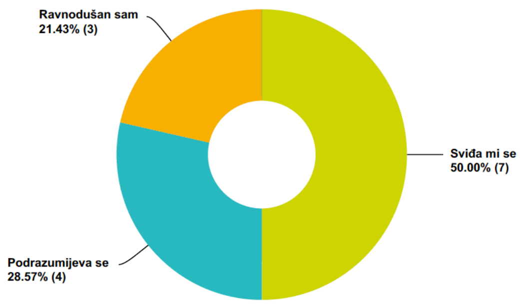
Answered: 14 Skipped: 0



Answer Choices	Responses	
Sviđa mi se	35.71%	5
Podrazumijeva se	42.86%	6
Ravnodušan sam	21.43%	3
Ne sviđa mi se	0.00%	0
Total		14

Q9 Imat ćete izravnu komunikaciju s klijentom putem aplikacije s dodatnim opcijama kao što su rezervacije i integrirane poslovne usluge (vlastite usluge i dodatni kanal za tržište za dobavljače).

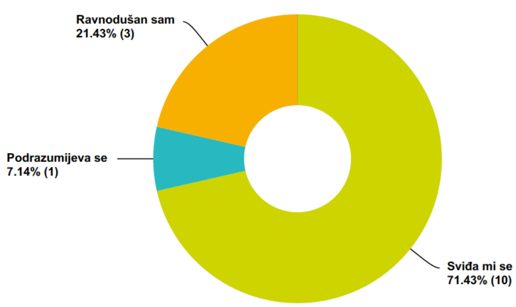
Answered: 14 Skipped: 0



Answer Choices	Responses	
Sviđa mi se	50.00%	7
Podrazumijeva se	28.57%	4
Ravnodušan sam	21.43%	3
Ne sviđa mi se	0.00%	0
Total		14

Q10 Aplikacija će integrirati feedove s punjenja vezova, mrežom senzora, ultrazvukom, meteorologijom, kvalitetom vode i mjerenjem valova.

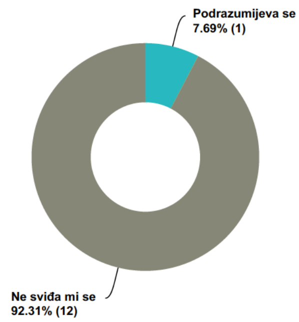
Answered: 14 Skipped: 0



Answer Choices	Responses	
Sviđa mi se	71.43%	10
Podrazumijeva se	7.14%	1
Ravnodušan sam	21.43%	3
Ne sviđa mi se	0.00%	0
Total		14

Q11 Sustav ne pruža dodatni kapacitet snage od 60 kW dobiven od obnovljivih izvora energije.

Answered: 13 Skipped: 1

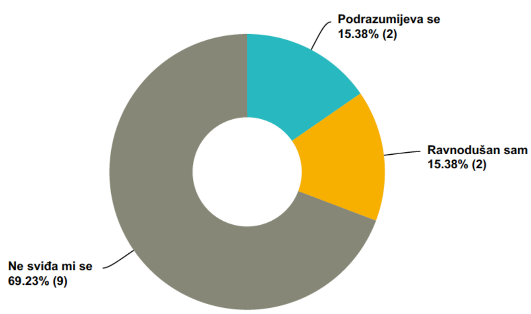


Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	7.69%	1
Ravnodušan sam	0.00%	0
Ne sviđa mi se	92.31%	12
Total		13

SmartMarina Koncept SurveyMonkey

Q12 Nećete imati mogućnost razmotriti proširenja (novo uspostavljenih) operacija na mjestima izvan mreže (otoci).

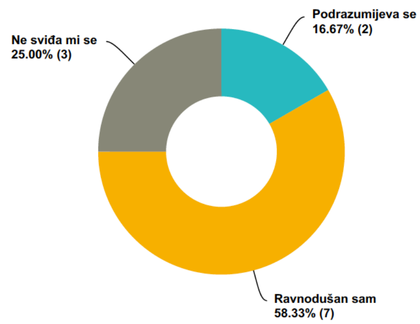
Answered: 13 Skipped: 1



Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	15.38%	2
Ravnodušan sam	15.38%	2
Ne sviđa mi se	69.23%	9
Total		13

Q13 Platforma ograničava optimizaciju potrošnje komunalnih usluga i ne pruža alate za upravljanje i kontrolom energije.

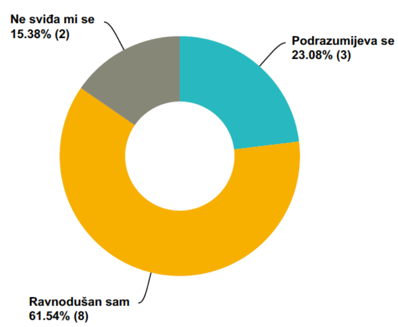
Answered: 12 Skipped: 2



Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	16.67%	2
Ravnodušan sam	58.33%	7
Ne sviđa mi se	25.00%	3
Total		12

Q14 Sustav upravljanja marinama nije centraliziran i nema nadzornu ploču sve-u-jednom ("all in one dashboard").

Answered: 13 Skipped: 1

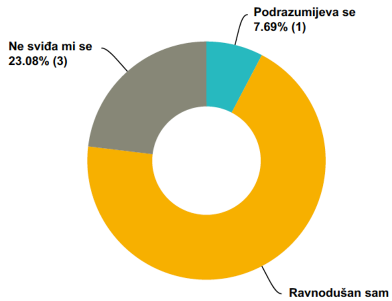


Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	23.08%	3
Ravnodušan sam	61.54%	8
Ne sviđa mi se	15.38%	2
Total		13

SmartMarina Koncept SurveyMonkey

Q15 Marina ne njeguje podatkovno čvorište ("data hub"), cloud i digitalni ekosustav, te analize sustava i potrošača nisu dostupne.

Answered: 13 Skipped: 1

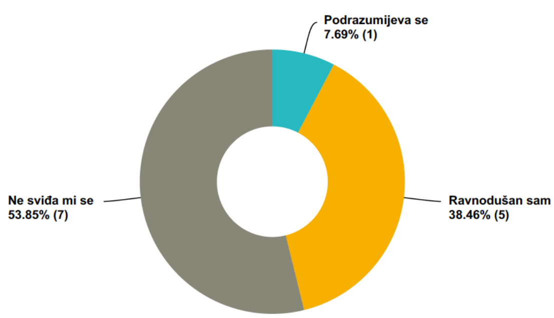


Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	7.69%	1
Ravnodušan sam	69.23%	9
Ne sviđa mi se	23.08%	3
Total		**13**

SmartMarina Koncept SurveyMonkey

Q16 Nemogućnost uspostavljanja izravne komunikacije s klijentima preko aplikacije (App) koja sadrži i dodatne mogućnosti korištenja poput rezervacije (booking) i integriranih poslovnih usluga (npr. vaših vlastitih usluge i usluga ostalih dobavljača).

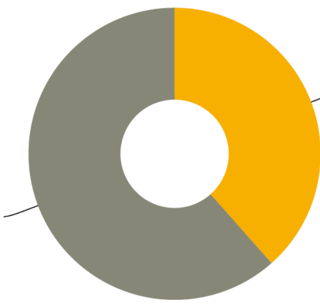
Answered: 13 Skipped: 1



Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	7.69%	1
Ravnodušan sam	38.46%	5
Ne sviđa mi se	53.85%	7
Total		**13**

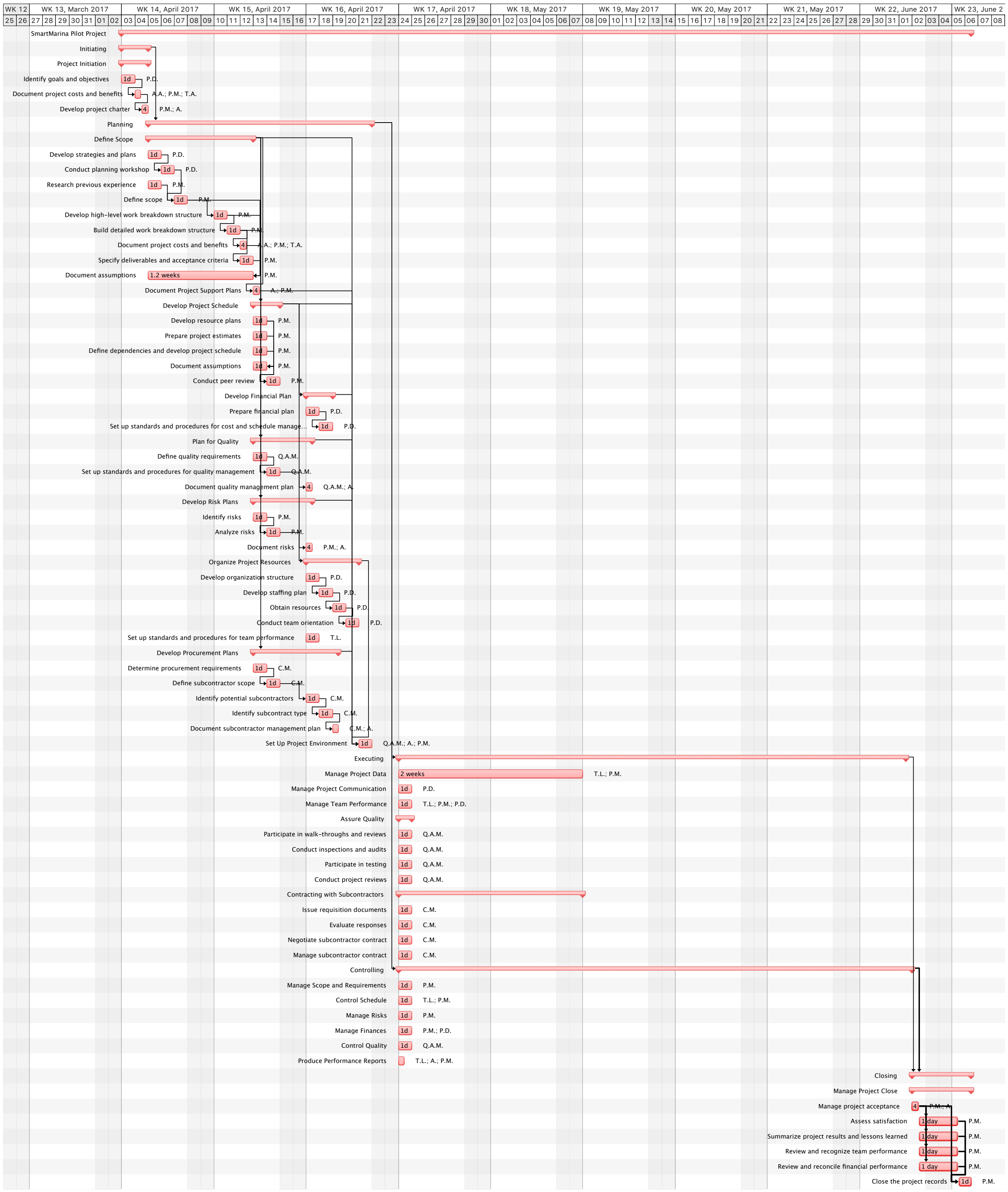
Q17 Nemogućnost ostvarivanja komunikacije putem feedova uživo preko APP-a s korisnicima koji u realnom vremenu primaju informacije koje se tiču punjenja brodova na sidrištu, mreže senzora marina, ultrazvuka, meteorologije, kvalitete vode i mjerenja valova.

Answered: 13 Skipped: 1



Answer Choices	Responses	
Sviđa mi se	0.00%	0
Podrazumijeva se	0.00%	0
Ravnodušan sam	38.46%	5
Ne sviđa mi se	61.54%	8
Total		13

Appendix C


SmartMarina Pilot Project
Initiating
Project Initiation
Identify goals and objectives
Document project costs and benefits
Develop project charter
Planning
Define Scope
Develop strategies and plans
Conduct planning workshop
Research previous experience
Define scope
Develop high-level work breakdown structure
Build detailed work breakdown structure
Document project costs and benefits
Specify deliverables and acceptance criteria
Document assumptions
Document Project Support Plans
Develop Project Schedule
Develop resource plans
Prepare project estimates
Define dependencies and develop project schedule
Document assumptions
Conduct peer review
Develop Financial Plan
Prepare financial plan
Set up standards and procedures for cost and schedule manage...
Plan for Quality
Define quality requirements
Set up standards and procedures for quality management
Document quality management plan
Develop Risk Plans
Identify risks
Analyze risks
Document risks
Organize Project Resources
Develop organization structure
Develop staffing plan
Obtain resources
Conduct team orientation
Set up standards and procedures for team performance
Develop Procurement Plans
Determine procurement requirements
Define subcontractor scope
Identify potential subcontractors
Identify subcontract type
Document subcontractor management plan
Set Up Project Environment
Executing
Manage Project Data
Manage Project Communication
Manage Team Performance
Assure Quality
Participate in walk-throughs and reviews
Conduct inspections and audits
Participate in testing
Conduct project reviews
Contracting with Subcontractors
Issue requisition documents
Evaluate responses
Negotiate subcontractor contract
Manage subcontractor contract
Controlling
Manage Scope and Requirements
Control Schedule
Manage Risks
Manage Finances
Control Quality
Produce Performance Reports
Closing
Manage Project Close
Manage project acceptance
Assess satisfaction
Summarize project results and lessons learned
Review and recognize team performance
Review and reconcile financial performance
Close the project records

Appendix D

Kano Model Calculation

Anleitung

1) Gehen Sie in das Tabellenblatt "Eingabe"

2) Geben Sie in den Zellen C5 bis C14 die Namen der Kriterien ein.

3) In den Zellen D5 bis D14 geben Sie die jeweilige Punktzahl pro Kriterium ein. Von 1 (sehr schwach) bis 5 (sehr stark). Natürlich können Sie hier auch Bruchwerte, z.B. 3,5 eingeben.
Wichtig: Über-/Unterschreiten Sie den Wert nicht von 5 bzw. 1.

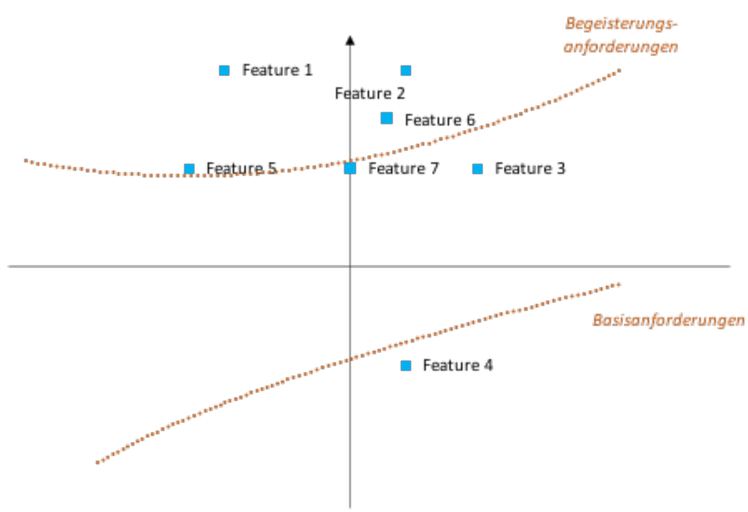
4) In den Zellen E5 bis E14 geben Sie die Anzahl für die jeweilige Punktzahl ein, die Sie für das jeweilige Kriterium erhalten haben.

5) Im Tabellenblatt "Kano-Modell" werden die eingegebenen Daten visualisiert.

6) Natürlich können Sie statt Kriterien auch Produkte/Marken/etc. bestimmen.

gelb markierte Zellen sind Eingabefelder

Kriterium	Punkte	Anzahl	Ø Anzahl	Max Faktor	X-Achse	Y-Achse	X-Achse	Y-Achse	Schrift
Feature 1	5.0	12	1		1	4.1	5	1	Begeisterungs-anforderungen
Feature 2	5.0	22	1		19	4.1	18	2	Basisanforderungen
Feature 3	4.0	26	1		34	5	34	2.8	Leistung
Feature 4	2.0	22	1						
Feature 5	4.0	10	1						
Feature 6	4.5	21	1						
Feature 7	4.0	19	1						
Ø		132	19	34					



Appendix E

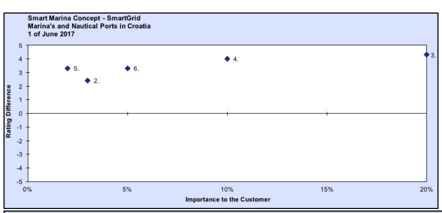
Analysis of Market Position

Product	Smart Marina Concept - SmartGrid
Segment	Marina's and Nautical Ports in Croatia
Date	1 of June 2017

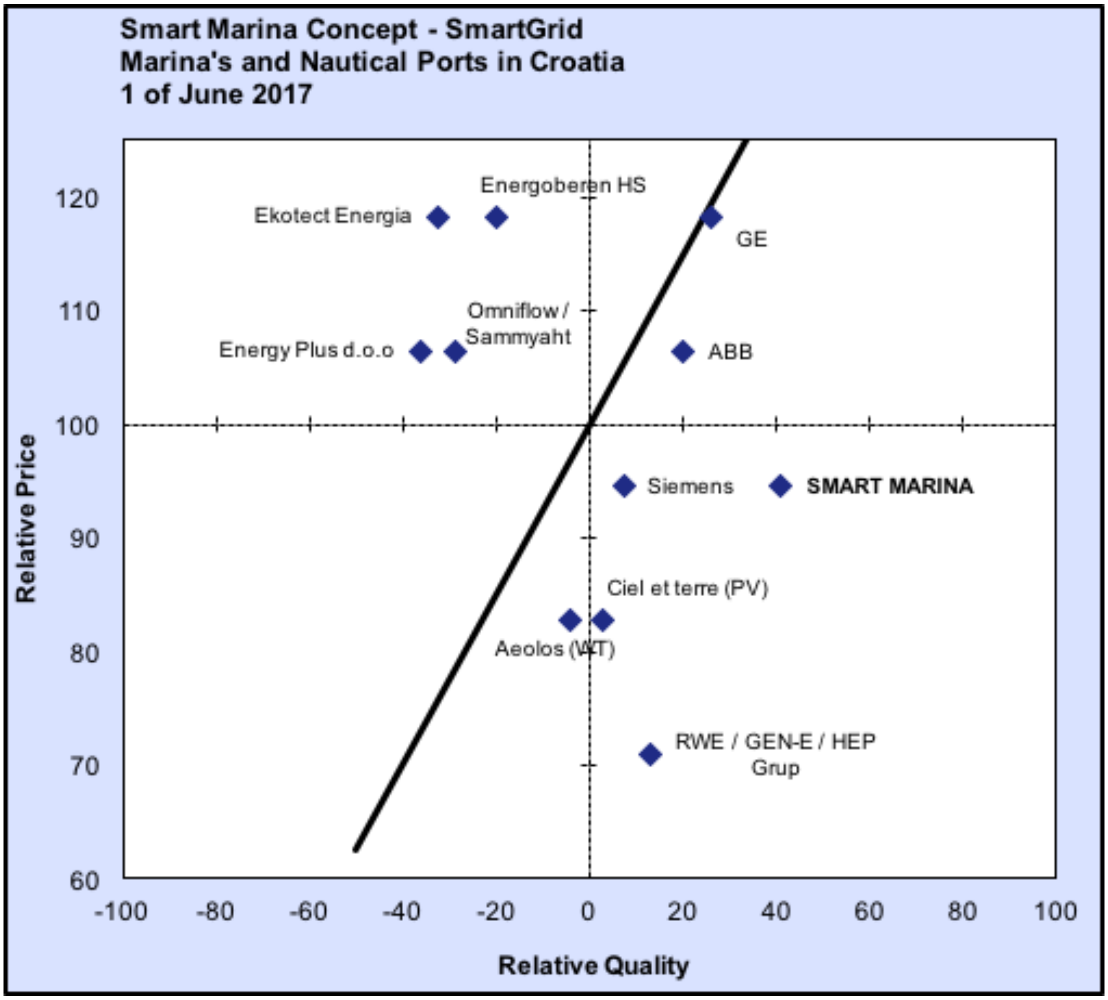
	Quality: Key Purchasing Attributes (product and service related, from customer perspective)	**Weigh-ting**	**Rating of Competitors**										
			SM	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
1.	Constant system and service quality in terms of RES power generation	30.0%	10	9	10	9	8	7	6	9	10	5	9
2.	Delivery time	3.0%	8	8	8	8	7	6	6	7	6	6	6
3.	High performance of energy management systems (cost savings)	20.0%	10	8	7	6	6	5	7	8	10	5	7
4.	Technical support	10.0%	10	9	8	8	8	6	7	7	7	5	7
5.	Quality of sales force	2.0%	8	6	6	6	5	5	5	7	7	5	5
6.	Product/Services range and degree of customization	5.0%	8	7	7	7	5	6	4	6	5	9	6
7.	Digital ecosystem and data hub innovation performance	10.0%	10	8	7	7	3	4	5	5	4	3	5
8.	Quality of APP for direct client communication	10.0%	10	8	7	7	5	4	3	5	5	8	5
9.	Customized specialized services integration (feeds)	10.0%	10	8	6	6	4	3	2	5	5	8	5
10.													
11.													
12.													
13.													
14.													
15.													
16.													
17.													
18.													
19.													
20.													
Sum		100%											
	Relative Price		8	10	9	8	10	9	10	7	6	9	7

Purchasing Decision	
Quality	60
Price	40
Total	100

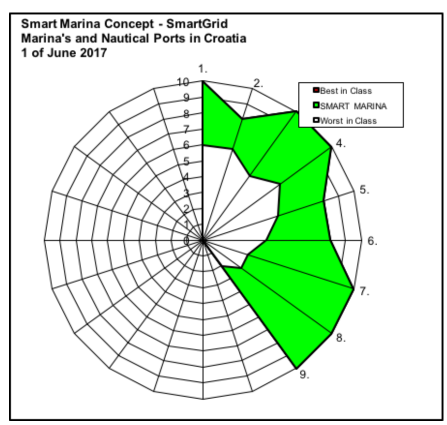
Name of Competitors	10	**Our Name**	SMART MARINA
A	GE		
B	ABB		
C	Siemens		
D	Energoberen HS		
E	Energy Plus d.o.o		
F	Ekotect Energia		
G	Ciel et terre (PV)		
H	RWE / GEN-E / HEP Grup		
I	Omniflow / Sammyaht		
J	Aeolos (WT)		



Key Purchsing Attributes	**Diff.**	**Weight**
1. Constant system and service quality in terms of RES power generation	1.8	30.0%
2. Delivery time	2.4	3.0%
3. High performance of energy management systems (cost savings)	4.3	20.0%
4. Technical support	4.0	10.0%
5. Quality of sales force	3.3	2.0%
6. Product/Services range and degree of customization	3.3	5.0%
7. Digital ecosystem and data hub innovation performance	5.7	10.0%
8. Quality of APP for direct client communication	5.6	10.0%
9. Customized specialized services integration (feeds)	6.1	10.0%



Quality : Price 60 : 40	rel. Price	rel. Quality
SMART MARINA	94.6	40.6
GE	118.3	26.0
ABB	106.5	20.2
Siemens	94.6	7.3
Energoberen HS	118.3	-20.0
Energy Plus d.o.o	106.5	-36.1
Ekotect Energia	118.3	-32.6
Ciel et terre (PV)	82.8	2.6
RWE / GEN-E / HEP Grup	71.0	13.0
Omniflow / Sammyaht	106.5	-28.6
Aeolos (WT)	82.8	-4.1



Appendix F

Website Audit Questions and results:

1. What is the full business entity name of marina?
2. What is the business address of the marina?
3. What is the website link of the marina?
4. What is the official email contact of the marina?
5. How many berths does the marina offer?
6. How many dry berths does the marina offer?
7. Can it foster mega yachts?
8. If so, what range?
9. What are the current amenities offered?
10. Does the marina have ISO, Golden Anchor or Blue Flag Accreditation?

Name	Adress	email	website	Berths	Dry Berths	Mega Yachts (m)	Amenities:
ACI Umag	Šetalište Vladimira Gortana 7, 52470 Umag	m.umag@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-umag/	475	40	40	reception with a bureau de change;cashpoint;restaurant;nautical equipment and clothing store;launderette;grocery store;beauty salon;laundrette;maintenance and repair shop;100 t travel lift;toilet and shower facilities; car park;Wi-Fi internet access;fuel station
ACI Rovinj	Šetalište Vijeća Europe 1, 52210 Rovinj	m.rovinj@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-rovinj/	192	0	18	
ACI Pula	Riva 1, 52100 Pula	m.pula@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-pula/	194	0	40	
ACI Pomer	Pomer 26 A, 52100 Pomer	m.pomer@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-pomer/	296	30		reception with a bureau de change; cash point; restaurant, grocery store; charter agency; toilet and shower facilities with separate disabled provision; laundrette; repair and maintenance shop; 10 t crane; car park; 63A power sockets for larger vessels; Wi-Fi internet access; fuel station in Pješčana Uvala (11nm); Pula (18 nm)
ACI Opatija	Liburnijska cesta 7 A, 51414 Ičići	m.opatija@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-opatija/	281	35	40	reception; exchange office; shopping point; restaurant; café bar; nautical equipment store and clothing store;fishing gear store; boat charter, insurance and sales agencies; newly refurbished toilet and shower facilities with separate disabled provision; laundrette; maintenance and repairs shop; 15t crane slipway; car park Wi-Fi internet access fuel station in Opatija harbour (2 nm away)
ACI Cres	Obala sv. Benedikta 3, 51557 Cres	m.cres@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-cres/	461	70	50	reception with an exchange office and with a shopping point with rich selection of accessories from the exclusive ACI collection, cashpoint restaurant,café bar, ice tube/ ice maker ,grocery store, launderette, bicycle and scooter hire nautical equipment and beach accessories store with souvenir shop, bicycle, car and scooter hire Soul & Body centre (massage) toilet and shower facilities with separate disabled provision, laundrette 10t crane, 80t travel lift, maintenance and repair shop, wastewater plant, 20m dismasting "needle" accommodation consisting of 8 spacious apartments car park Wi-Fi internet access fuel station
ACI Supetarska Draga	51280 Rab	m.supdraga@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-supetarska-draga/	328	53		reception with a bureau de change restaurant, grocery store in the immediate vicinity of the marina toilets and showers with separate disabled provision, laundrette maintenance and repairs shop, 10t crane car park Wi-Fi internet access fuel station next to ACI Marina Rab (11 nm)
ACI Rab	Šetalište kap. I. Dominisa 101, 51280 Rab	m.rab@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-marina-rab/	142	0		reception with a bureau de change (seasonal), cashpoint restaurant, café bar, beauty salon nautical and fishing gear store, boat equipment and spare parts store toilets and showers with separate disabled provision maintenance and repairs shop, 10t crane in the immediate vicinity of the marina Wi-Fi internet access fuel station in the immediate vicinity of the marina
ACI Šimuni	Obala 1, 23251 Kolan	m.simuni@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-simuni/	191	45		reception with an exchange office and with a shopping point with rich selection of accessories from the ACI collection, cash point first-class seafood restaurant grocery store toilet and shower facilities with separate disabled provision 15t crane, maintenance and repair shop, slipway for boats up to 8 m in length car park Wi-Fi internet access fuel station in Novalja harbour (7 nm)
ACI Žut	Obala sv. Ivana 47 E, 22242 Jezera	m.zut@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-zut/	135	15	40	reception with an exchange office (seasonal) and with a shopping point with rich selection of accessories from the ACI collection, restaurant grocery store toilet and shower facilities fuel station in the port of Zaglav on Dugi Island (8 nm) ATM
ACI Piškera	Obala sv. Ivana 47 E, 22242 Jezera	m.piskera@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-piskera/	118	0		reception with an exchange office (seasonal) and with a shopping point with rich selection of accessories from the ACI collection restaurant grocery store toilet and shower facilities fuel station in the port of Zaglav on Dugi Island (12 nmi) ATM
ACI Jezera	Obala sv. Ivana 47 E, 22242 Jezera	m.jezera@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-jezera/	233	60		reception with an exchange office and with a shopping point with rich selection of accessories from the exclusive ACI collection, restaurant, swimming pool, launderette toilet and shower facilities, launderette maintenance and repair shop, 10 t crane charter agencies , sailing school Wi-Fi internet access fuel station
ACI Skradin	Obala bana Pavla Šubića 18, 22222 Skradin	m.skradin@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-skradin/	180	0	70	reception with a bureau de change bistro restaurants and shops with authentic Croatian products and souvenirs shop next to the marina two toiletes and shower facilities Wi-Fi internet access fuel station in the port of Šibenik (8 nm) ATM

ACI Vodice	Artina 13 A, 22211 Vodice	m.vodice@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-vodice/	273	50		reception with an exchange office and with a shopping point with rich selection of accessories from the ACI collection cash point , caffe bar and restaurant, stores, souvenir shop in the immediate vicinity of the marina, charter agency toilet and shower facilities with separate disabled provision, launderette maintenance and repair shop, 10 t crane, 60 t travel lift car park Wi-Fi internet access fuel station
ACI Trogir	Put Cumbrijana 22, 21220 Trogir	m.trogir@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-trogir/	174	35		reception with a bureau de change, cashpoint restaurant, café bar fitnesscentre, charter agencies grocery stores and nautical equipment stores toilet and shower facilities with separate disabled provision diving school, sailing school repair and maintenance shop, 9 t crane car park laundry washer and drier fuel station Wi-Fi internet access
ACI Split	Uvala Baluni 8, 21000 Split	m.split@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-split/	318	30		reception with an exchange office and with a shopping point with rich selection of accessories from the ACI collection cashpoint several restaurants with cafe bar ,ice tube / ice maker toilet and shower facilities with separate disabled provision, launderette grocery store, nautical equipment store charter agencies and boat sales service repair and maintenance shop, sail repair shop, 10 t crane, 45 t slipway, dismasting "needle" fuel station at 100 metres' distance Wi-Fi internet access
ACI Milna	21405 Milna	m.milna@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-milna/	183	15		reception with a bureau de change, cashpoint restaurant, café bar, car and scooter hire, grocery store nautical equipment and spare parts store diving services toilet and shower facilities with separate disabled provision, launderette maintenance and repair service, 8 t crane Wi-Fi internet access fuel station at the entrance to the marina
ACI Vrboska	21463 Vrboska	m.vrboska@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-vrboska/	119	17		reception with a bureau de change toilet and shower facilities, launderette 5 t crane car park Wi-Fi internet access in the immediate vicinity of the marina there are several restaurants, taverns and bakeries fuel station
ACI Palmižana	21450 Hvar	m.palmizana@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-palmizana/	180	0		reception desk with a bureau de change (seasonal) restaurant and café bar massage (gazebo) grocery store children's playground and a bocce court toilet and shower facilities Wi-Fi internet access fuel station in the town port of Križna luka (2.5 nm)
ACI Korčula	20260 Korčula	m.korcula@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-korcula/	159	16	40	reception with an exchange office and with a shooping point with rich selection of accessories from the ACI collection, cashpoint restaurant, cafe bar, grocery store, nautical equipment , household items and gift stores, hairdresser repair and maintenance shop, 10t crane toilet and shower facilities with separate disabled provision car park Wi-Fi internet access fuel station 0.5 km from the marina border crossing point in town open year-round room and apartments accommodation in the period from June till October
ACI Marina "Veljko Barbieri" Slano	Slanica 2, 20232 Slano	m.slano@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-slano/	193	0	20	reception with a bureau de change and a shopping point with a rich selection of accessories from the exclusive ACI collection swimming pool restaurant toilet and shower facilities with separate facilities for disabled people, launderette charter agency car park Wi-Fi internet access
ACI Dubrovnik	Na skali 2, 20236 Mokošica-Komolac	m.dubrovnik@aci-club.hr	http://www.aci-marinas.com/en/aci_marina/aci-dubrovnik/	380	140	60	reception with an exchange office, with a shopping point with rich selection of accessories from the ACI collection, ATM restaurant, cafe bar, beer hall, internet café super market, nautical equipment store charter agencies tennis and bocce court, futsal pitch with artificial grass, children's Pirate Ship themed playground swimming pool, hairdresser, massage, fitness outdoors toilet and shower facilities with separate disabled provision, launderette repair and maintenance service, travel lifts with 60 and 130 t capacity fuel station Wi-Fi internet access ATM
Marina Martinis Marchi		marina@martinis-marchi.com	https://www.martinis-marchi.com/marina	50		35	Marina (open all year) Electricity (16 - 63A) Water Toiletts / Showers Video security WiFi Caffe / Amphitheater (season only) MY Luxury charter offer (season only) Restaurant (season only) Heritage Hotel (season only) Off road jeep

Marina Kastela	a Franje Tuđmana, 21213, Kaštel Gomilica, Cr	marina@marina-kastela.hr	http://www.marina-kastela.hr/en/	420	400		Hangars for vessels 60 ton travel lift 200 ton travel lift* 60 ton carello for safe on land boat transport 40 ton carello for safe on land boat transport 5 ton crane Usage of warehouse Air conditioned lounge for charter guests* Reception Supermarket Café-bar Restaurant 437 parking spaces boat maintenance workshops and services sanitary facilities with showers 25 m swimming pool* Sailing club, with facilities for commercial and sport regattas – unlimited number of participants* Vacuum sewage pump system* Hotel with congress center*
Marina Zirona	Drvenik Veli			140			Marina still does not have the facilities. Near the marina there is a restaurant. Other facilities are available in the village. The island of Mali and Veli Drvenik are located in the immediate vicinity of Trogir and have beautiful sand and pebble beaches.
Marina Agana	Dr. Franje Tuđmana 5 Marina 21222 Croatia	info@marina-agana.hr	http://www.marina-agana.hr/	134			reception, travle lift 40t, camping gas refil, cash point, contractors, free wifi, laundrette, library, local shops, outdoor gym, toilets and shower, waste disposal and revycling, forklift, water and electricity
Laguna trade d.o.o. - Marina Frapa	Uvala Soline 1, 22203 Rogoznica,CROATIA	hr; servis@marinafrapa.hr; market	http://www.marinafrapa.hr/	462	150	40	Emergency repairs on vessels (engines, navigation equipment, sailing equipment) Regular service of engines and boat equipment Contracted maintenance of boats and equipment Repairs of vessels (elimination of accident consequences and other damage on the vessel and equipment, painting and varnishing of boats) Others work for the preparation of the boat for the sea Works on the infrastructure maintenance of the nautical tourism port Towing vessels in the sea around Rogoznica 75-ton travel lift for lifting and lowering of vessels Waste disposal site for waste oil, filters and batteries Device for discharging of fecal tanks Filling of gas bottles
Marina Kremik	Splitska 22-24 22202 Primosten Horvátország	marina-kremik@adriatiq.com	https://marinakremik-adriatiq.com/en	393	150		the reception, restaurant, market, nautic shop, technical service with a complex workshop, and a petrol pump and taxi service, if you need it. It is also possible to rent a large number of luxurious charter vessels
D-Marin Borik	bala kneza Domagoja 1 23000 Zadar, CROATI	borik@d-marin.com	http://www.d-marin.com/en/marinas/croatia/borik/about-us.aspx	177	50		Dry dock capacity: 50 24-hour water supply 24-hour security with guard and CCTV Fire warning and extinguishing systems 24-hour power supply (220/380 V) Fuel services (100 m from marina) Outdoor car parking Console crane: 5 T Truck mobile crane: 20 T Hull pressure washing & cleaning
D-Marin -Marina Mandalina	bala Jerka Šižgorica 1/22000 Šibenik, CROATI	mandalina@d-marin.com	http://www.d-marin.com/en/marinas/croatia/mandalina/overview.aspx	429	79	140	Reception, exchange, control tower, restaurant, travel lift, supermarket, waste disposal, yacht chandlery, shipyard, service, laundry, church, sanitary, parking
D-Marin Dalmacija	Bibinje-Sukošan 1 23206 Sukošan , CROATIA	dalmacija@d-marin.com	http://www.d-marin.com/en/marinas/croatia/dalmacija/about-us.aspx	1200	300	80	4 lift pools Travel lifts: 30 T & 35 T & 80 T Trailer: 20 T Hull and vessel painting General Services: 24-hour water supply 24-hour power supply (220/380 V) 24-hour dock assistance Fuel station WC and shower Laundry Video surveillance Wireless internet access 1,200 car parking places 220 individual garages Technical Services: Engine maintenance and repair Marine electronics Boat carpentry Lathing and metalwork Ventilation, bilge control, air conditioning Battery control and charging General cleaning works Ship chandlery Navigation and satellite system repairs Upholstering Zinc Replacement
Marina Zaton	22215, Zaton Sibenski Croatia	info@crobos.com; croatia@dreamyachtcharter.com		30			electrical connections (16A and 32A) and water. In the complex of the marina you can find: parking, restaurant/bar with seating for 150, reception, Internet corner and sanitary facilities. The marina is located 500 meters from the center of town where there are shops, post office, ambulance, fire department, church, restaurants and bars.
Marina Tribunj	Jurjevgradska 2, 22212 Tribunj, Croatia	marina-tribunj@adriatiq.com	https://marinatribunj-adriatiq.com/de	240	150		filling station as well as a high quality ship service from the company Merk & Merk. Furthermore, we have well-equipped rooms and apartments in the main building of the Navy throughout the year.

Marina Hramina	PUT GRADINE 1 22243 MURTER HRVATSKA	AMINA.HR; MARKETING@MARINA-	http://marina-hramina.com/en/	370	120		restaurant, nautic shops, supermarket, souvenir shop, laundry facilities, rent a scooter, services, boat dealers representative. free internet access as well as free SAT/TV access to all our guests. For our guests we have a newly renovated toilets and beautiful beach.
Marina Betina	N. Škevina 15 HR-22244 Betina	marina-betina@si.t-com.hr	http://www.marina-betina.com/	240	100		Berths provide water and electricty terminals Marina has a 24-hour sailor service Marina area is under video surveillance Jetty sea depth ranges from 3 to 8 meters, "Kalafat" restaurant Charter agencies Yachtsmen equipment store Food store Sanitary facilities with showers Laundry Exchange office 120 parking places
Marina Sangulin	Kraljice Jelene 3, Biograd na Moru	info@sangulin.hr	http://www.tzg-biograd.hr/de/65/marina-sangulin	200			
Marina Kornati	Marina Kornati Obala Kneza Branimira 1 HR-23210 Biograd na Moru	info@marinakornati.com	http://www.tzg-biograd.hr/de/64/marina-kornati	750			electrical connection 16 A, 32 A (single phase and three phase), 63-A three-phase (total of 850 terminals) water connection 4-5 bars (270 total terminals) Parking spaces for 700 passenger cars At each table, which is located on the pier every 19 m, built six connections for electricity, lighting one body and two water taps. Electrical cabinets are European standards. Marina Kornati extends to 91,912 m2 of the sea (waters) and 39.688 m 2 of land area, and consists of three waters: Central waters The western waters Coastal waters The marina entrance is 40 m and the maximum depth - draft is up to 6.50 m. Sanitary blocks with showers are located in each of akvatorija. Piers are guarded 24 hours a day. Water and electricity is included in the slip.
Marina Tankerkomerc marina Veli Iž	23284, Veli Iž, Croatia	marina.iz@tankerkomerc.hr	http://www.marinazadar.com/en/o-nama/	150	45		
Marina Tankerkomerc Marina Zadar	Ivana Meštrovića 2 23000 Zadar CROATIA	marina@tankerkomerc.hr	http://www.tankerkomerc.hr/djelatnost.php?id=1&grupa=2	300	200		
Marina Sutomišćica	23273 Sutomišćica, Ugljan, 23273, Croatia	oliveisland@marina-signum.com	http://oliveisland-marina.eu/index.php?lang=en				
Marina Preko	Marina Preko d.o.o. Vrulja 2, 23273 Preko Croatia	manager@marinapreko.com	http://www.marinapreko.com/				
Marina Vitrenjak	Obala kneza Trpimira bb POSTCODE: 23000 Zadar	office@jkuskok.hr	http://www.esys.org/rev_info/Kroatien/Vitrenjak_Marina_(Zadar).html				showers / WC, gas station nearby, restaurants, shops, supermarket, electricity / water at the jetty, 1-t and 2 t crane, travel lift, Slip, Crane, doctor, bank, post office
Marina Lumbarda	bala kneza Domagoja 1 23000 Zadar, CROATI	borik@d-marin.com	http://www.lumbarda-marine.com/	110			and water connections, showers, parking and changing room. Other facilities are available in the downstream Marina Borik. Marina has 2 cranes (2,5 and 5,5 tons).

Appendix G

SWOT Analysis Manufacturing Industry (ECSIP, 2015)

Internal to sector	External to sector
Strengths: • The EU hosts European multinational companies, operating on the world market, with significant market power; • The 'EU brand' is strong. Customers from outside the EU prefer to buy recreational crafts from an European brand, as it represents high quality and value added; • European boat builders have clear competitive advantages in knowledge (innovation) and design. The sector is innovative and develops new high-end technologies (e.g. electric propulsion).	**Opportunities:** • Potential demand for new products and new markets in upcoming economies e.g. China and the Middle-East; • The request for (and availability of) new technologies, such as electric propulsion, which strengthens process and product innovation; • The further alignment of international regulatory framework; i.c. the further harmonization of EU and US recreational craft legislation and standards in order to reduce the entry barriers for European manufacturers to foreign markets.
Weaknesses: • Some boat builders face a lack of investment due to volatile cash flows and a shortage of funds. Investments in innovation are lacking behind; • The production of boats can either be done in serial numbers of customized build. Overall, manufactures tend to realize low productivity (and profitability) figures; • Due to specific employment needs and skill requirements, some manufacturers face technical skills shortages.	**Threats:** • Demographical changes, ageing, and changing leisure expenditures result in a changing business environment; • The 'sharing economy' results in changing customer demand, and a growing charter segment; • Increased competition from boat builders in upcoming economies, in combination with existing import barriers (e.g. China and Brazil); • External financers (e.g. banks) are still reluctant to provide credit, which creates difficulties in relation to the access to finance.

SWOT Analysis Marinas (ECSIP, 2015)

Internal to sector	External to sector
Strengths: 1. Density of marina's/good network (proximity to tourist areas): Overall the density of the marina network is good in the EU which attracts many sailors to come to Europe; 2. High quality standards: The quality of marinas in the EU is relatively high, increasing the attractiveness of the brand; 3. "Europe" is a strong brand: Europe is the worlds tourism destination number 1 and also in sailing a very popular destination. The brand of "Europe" remains strong; 4. Strong internal demand: The EU internal demand remains high which guarantees stability over years.	**Opportunities**: 1. Integrated regional development (clusters): A stronger integration of marina development in the regional development can create synergies and increase overall tourism offer in the area; 2. IT services (apps): IT services are already a must in the sector. New applications facilitating the operation and the move from one marina to the other may further attract customers; 3. New user concept (house + boat + rental): New concepts combining different offers and hence providing 'all-inclusive' solutions can attract further customers which are less interested in long and detailed planning processes.
Weaknesses: 1. Local focus (sometimes "poorly organised")/fragmented/different interests: Coordination between marinas for coherent development is often lacking. Every marina follows its own development path which causes risks for the overall branding of a region; 2. Slow innovators: Innovations are often only picked-up when absolutely necessary; 3. Not always focused on clients (old-fashioned): The client orientation is missing in many marinas. The business style is often old style and is lacking a service oriented culture. There is large discrepancy between individual marinas. Some have strongly modernized their business model, while others remain in 'old' structures; 4. Regularly hurdles to develop marinas (local): Local regulatory barriers to invest in marina developments may hamper their growth potential and cause reduced competitiveness over time.	**Threats:** 1. Aging of users/owners: The ageing of boat owners is becoming a problem and causes challenges in accessibility in marinas; 2. Aging of boats (environmental concern + hampering demand): The ageing of boats may become an issue if sufficient recycling offer is missing; 3. Changing demand: Changing demand structures from boat owning to charter as well as different boat sizes require marinas to be adaptive. This is not always easy as sometimes bigger investments are needed; 4. Difficulty to expand: Marinas are usually in the centre of villages and hence have geographical limits for expansion.

Appendix H

EXECUTIVE ACADEMY

MARKET CONDITIONS, SUPPORT SCHEMES AND DRAFT BUSINESS CASE

Solar-Wind Project Croatia

Abstract

The document covers the electricity market conditions in terms of country characteristics, key figures and main pillars for Renewable Energy Sources and Support Policy detailing the current auction status and proposed design. Furthermore, a detailed summary of the available support schemes is presented including the parameters and conditions to be fulfilled alongside a draft business case for projects within the 30kW range

Preda Mircea

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DOCUMENT DOWNLOAD LINK:
https://drive.google.com/open?id=0B6SOgNHDqrYSZHpqZHZyUHl2akk

EXECUTIVE
ACADEMY

AN OPPORTUNITY ANALYSIS FOR HYBRID SOLAR-WIND ELECTRIC POWER SYSTEMS WITH A RANGE OF 30-300KW IN CROATIA

Abstract

The document covers a potential venture in the Croatian market by offering a customizable Hybrid Solar-Wind electric power system ranging between 30-300 kW by exploring all related factors ranging from competitive technology, competitors, market trends, funding, legal, corporate assessment as well as the next steps and critical steps translating the opportunity into a viable venture.

Mircea Preda
Mircea.preda@adrem.ro

DOCUMENT DOWNLOAD LINK:
https://drive.google.com/open?id=0B6SOgNHDqrYSZHpqZHZyUHl2akk

Appendix I

SMART MARINA SUPPLIER PRODUCT BROCHURES

DOCUMENT DOWNLOAD LINK:
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