MSc Program
Renewable Energy in Central and Eastern Europe

Professional Market Intelligence for Renewable Energy Companies in the European Union

A Master's Thesis submitted for the degree of
"Master of Science"

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November 2013, Graz

Affidavit

I, **Michael Müllneritsch**, hereby declare

1. that I am the sole author of the present Master Thesis, "Professional Market Intelligence for Renewable Energy Companies in the European Union", 87 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 Thesis as an examination paper in any form in Austria or abroad.

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ABSTRACT

In order to find suitable solutions to support renewable energy companies in their decision making process the market intelligence process was analyzed. Thereafter the renewable energy market was investigated and for each market segment an example how the Market Intelligence process can support the decision making process was provided all along the intelligence cycle. Finally the successful establishment of an own Market Intelligence program and its contribution to the improvement of the decision making process within a company was proven based on two case studies.

The main results are firstly that the renewable energy market in the European Union, due to its dynamic market environment requires a quick and based on profound knowledge reaction on market developments. Secondly, that a well-established Market Intelligence program can provide the decision makers within a renewable energy company with a solid information basis and delivers advices for the reaction or can even anticipate such developments and help to act proactively.

The main conclusion is that a profound market knowledge and analysis that can be provided by a well-established Market Intelligence program is essential for a renewable energy company to remain competitive and develop even within this dynamic market environment.

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LIST OF ABBREVIATION AND SYMBOLS

€	Euro
AEBIOM	European Biomass Association
BNEF	Bloomberg New Energy Finance
CEER	Council of European Energy Regulators
CHP	Combined Heat and Power
CO2	Carbon dioxide
CSP	Concentrated solar power
DNI	Direct Normal Irradiance
EBIT	Earnings before interest and taxes
EGS	Enhanced Geothermal Systems
EIA	Environmental Impact Assessments
EPIA	European Photovoltaic Industry Association
EGEC	European Geothermal Energy Council
EREC	European Renewable Energy Council
ESHA	European Small Hydropower Association
ESTIF	European Solar Thermal Industry Federation
EU	European Union
EWEA	European Wind Energy Association
FIT	Feed-in tariff
GWth	Gigawatt thermal
KIQs	Key intelligence questions
KITs	Key intelligence topics
Ktoe	Kilotonne of Oil Equivalent
KW	Kilowatt
KWth	Kilowatt-thermal
M^2	Square meter
MI	Market intelligence
Mtoe	Megatonne of Oil Equivalent
MW	Megawatt
MWe	Megawatt electrical
MWh	Megawatt-hours
MWp	Megawatt-peak

MWth	Megawatt-thermal
NREAP	National Renewable Energy Action Plan
OEM	Original Equipment Manufacturer
PV	Photovoltaic
RSS	Rich Site Summary
SCIP	Strategic and Competitive Intelligence Professionals
SHP	Small Hydro Power
SRC	Short Rotation Coppice
TEN-E	Trans-European energy infrastructure
TWh	Terawatt-hours
UK	United Kingdom
WWEA	World Wind Energy Association
WFD	Water Framework Directive

1 INTRODUCTION

1.1 CORE OBJECTIVE AND CORE QUESTION OF THE THESIS

The core objective is to analyze the methods and solutions of the market intelligence approach and the current situation of the renewable energy market in the European Union in order to find suitable solutions to support renewable energy companies in their decision making process.

Core question:
What can market intelligence solutions contribute to the commercial success of renewable energy companies considering the particularities of the various renewable technologies and the political environment in the investigated region?

1.2 CITATION OF THE MAIN LITERATURE

EurObserv’er: “The State of Renewable Energies in Europe”, Observ'ER, Paris, 2012.

Hedin Hans et al: “The Handbook of Market Intelligence”, Wiley & Sons, Hoboken, 2011.

Michaeli Rainer: "Competitive Intelligence" Springer, Berlin, 2006.

Weber Jürgen et al: “Erfolgreich steuern mit Market Intelligence“, Wiley-Vch, Berlin, 2008.

Pepels Werner: “Market Intelligence“, Publicis, Erlangen, 2007.

1.3 STRUCTURE OF THE WORK

Method of approach:

An analysis and structuring of the market intelligence process followed by the investigation of the renewable energy market in the European Union shall lead to results, which are tested on the basis of case studies of successful implementations of market intelligence solutions.

Expected results:

In such a wide and diversified market as the renewable energy market the need for market intelligence solutions is very strong. The case studies will provide suitable solutions for renewable energy companies. Software based market intelligence solutions together with a well-founded human intelligence will be proven as necessary for a renewable energy company to optimize its corporate strategy and decision making process in the fast changing market and to compete with the traditional energy companies.

2 DEFINITION AND APPROACH OF MARKET INTELLIGENCE

2.1 DEFINITIONS AND GENERAL APPROACH

Market Intelligence is *"a systematic process for the collection and analysis of data and for the creation, dissemination and use of marketing information, with the aim of realizing company goals."* (Moenaert et al., 2008).

In other words Market Intelligence shall provide the decision makers in a company with all relevant market information to support the decision making process.
Usually the market information expected by the decision makers contains the market size, structure and development, trends, competitive environment, customer behavior and expectations, and the legal environment.

Market Intelligence is gathered through internal analysis, competition analysis, and market analysis about the total environment forming a broad spectrum of assembled knowledge, which is then used for developing scenarios so that timely reporting of vital foreknowledge for future planning in the areas of strategic, tactical, and counter-intelligence decision-making can be applied operationally and strategically in respect to the whole organization's strategic interest for the whole market.
(Grooms, 1998)

According to this definition by Dr. Thomas Fletcher Grooms, the inventor of the term Market Intelligence the scope of Market Intelligence is very broad. It covers the whole internal and external business environment of a company.
To fulfill all these tasks and provide satisfying result a well-structured approach is essential. Therefore the market intelligence process was established, which will be described in more detail below.

2.2 MARKET INTELLIGENCE PROCESS

2.2.1 Needs analysis

Because of its structure the market intelligence process is often also called the intelligence cycle. This process starts with the needs analysis to identify the involved persons, the topics, and the format of the expected deliverables, the budget and the timeframe.

Figure 1: Structure of a Market Intelligence process - Intelligence Cycle (Source: "The Handbook of Market Intelligence", Hedin et al., 2011).

Depending on the level of the already established MI program within a company the first step is either to identify or to assign the persons responsible for MI and to determine their position within the company and the addressees of the investigation. According to the 2013 survey of the Global Intelligence Alliance the Market Intelligence function is mainly placed either in the strategic/business development or the sales & marketing department (GIA, 2013).

These two departments represent also the main addressees for a MI investigation. Therefore, depending on the focus and the budget of the specific company, the most MI investigations collect and analyze data to support the strategic or the sales department, preferably both.

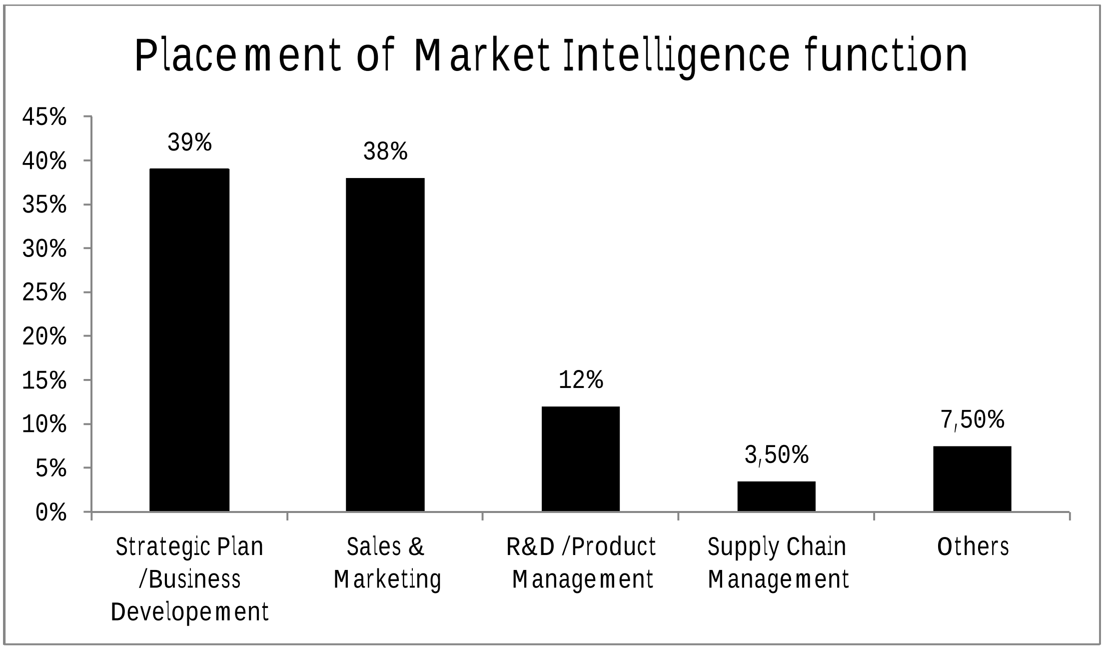


Figure 2: Placement of the MI function within companies (Source: Global Market Intelligence Surveys, GIA, 2013).

The next step in the needs analysis phase is the identification of the topics of the MI investigation - the so called *"stimulation phase"* (Pepels, 2007).

The figure beneath shows the different dimensions of the intelligent topics: The value chain, the geographical area and the economic level.

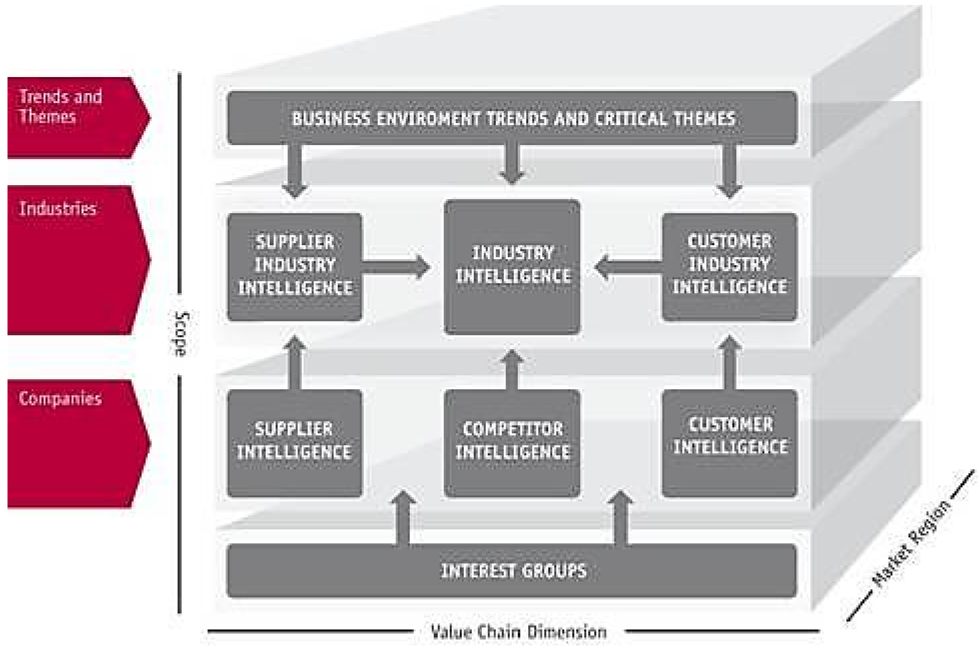


Figure 3: Dimensions of the intelligence topics (Source: "The Handbook of Market Intelligence", Hedin et al., 2011).

A MI process can cover the whole value chain or focus on just parts of it like the suppliers, the competitors or the customers. The depth of the scope can also go from overall trends in the market, via the industry level to a detailed company level. The third dimension affects the geographic focus of the MI process, whether it should cover a country, regional or global level. To ensure that all the needed topics and the right formats are covered every need analysis includes interviews with the potential MI-users to identify the Key Intelligence Topics (KITs) and the Key Intelligence Questions (KIQs) (Michaeli, 2006).
During these interviews also the expected format has to be defined. The format of the deliverables strongly depends on the hierarchy level and duties of the addressees. On the highest management level a short strategic summary of the results is desired, whereas a sales manager prefers a more detailed sales oriented format. The time frame also influences the format. For the preparation of an internal or customer meeting a rapid response research within a few days can deliver sufficient results, whereas for the development of the sales strategy a continuous market monitoring might be necessary.
For setting up a MI budget it’s necessary to clarify if you need continuous market monitoring and whether an own MI know-how should be established within the company or not. In case a company just needs ad-hoc research some times per year a rather low budget is needed and most of this work can be done cheaper externally. For the setup of a real own MI program with continuous market monitoring a significantly higher budget is necessary and the establishment and development of an own MI know-how within the company will be more cost effective on the long run. The figure below gives an impression of the average MI budgets of different sized companies.

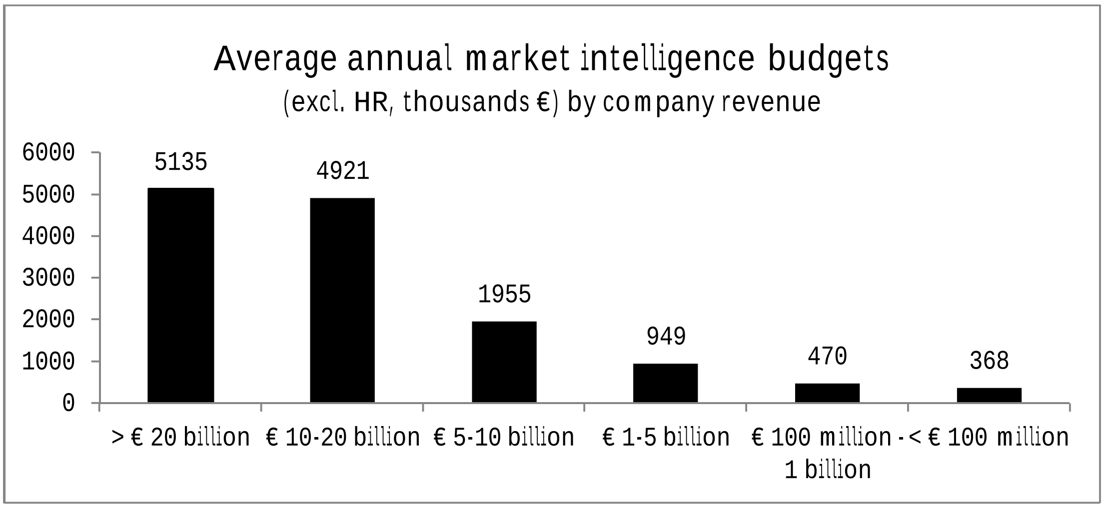


Figure 4: Average annual market intelligence budgets (Source: Global Market Intelligence Surveys, GIA, 2013).

2.2.2 Secondary research

Secondary research is also often called desk research and forms the basis for the MI research. During this research already available sources like studies, company reports and data bases are used to find the needed data. These sources can either be free or cost intensive. The decision if a cost intensive source (e.g. the costs for studies can vary between several hundreds and tens of thousands €) will be used strongly depends on the availability of free source, the MI budget and the expected format of the results. For instance a rapid response research usually has such a short time frame and low budget, that only free or very cheap sources can be used. For a continuous market monitoring a subscription of an external data service can help keeping the costs reasonable and guarantee a solid base for the following analysis.
Depending on the expected results a secondary research alone can deliver sufficient data for the analysis or an additional primary research is necessary.

2.2.3 Primary research

The primary research offers a more customized data research than a secondary research. A direct questioning of customers, competitors or market experts can deliver exactly the needed answers to the KIQs.
Depending on the expected level of detail of the answers the following main types of questioning are used:

- **Personal interview:**
  The personal interview offers the highest potential for detailed answers and estimations of the interviewee. This format gives the interviewer also the possibility to register and react on the body language and mimic of the interviewee. Since this format is rather time consuming and therefore expansive it's just used to get real insights from market experts or top managers. The geographical focus of the MI investigation also strongly influences the decision to use this format. In Japan for instance a personal interview is the only possibility to get answers from the expert or higher management level.

- **Trade show and conference intelligence**
  This is a very special and popular format of primary research, because it offers a wide range of possibilities for personal interviews with experts all along the value chain at the same time. Besides the increased willingness of experts to answer questions in such an environment this format overs also the possibility to collect data concerning the presentation of new products and the related reaction of competitors and customers and the overall market trends.

- **Telephone interview:**
  The telephone interview is more cost-effective and offers the possibility to make interviews without any geographical restriction. The often used video conference can compensate the disadvantage of the absence of a real personal contact and at the same time still offer the interviewee the psychological advantage of more distance and anonymity (Pepels, 2007).

- **Online survey**
  An online survey is the main choice for collecting basic information from a huge number of interviewees and therefore suitable for customer interviews. This format is a rather cheap and quick possibility to get a lot of basic data from many different sources. It's also very convenient for the interviewee, because he can answer the questions when and wherever he wants. The missing of an interviewer reduces on the one hand the barrier for disclosing information directly to another person, but on the other hand also makes it unlikely to get the real deep insight, which a well-trained interviewer might get.

Besides the advantages of the primary research there is also the threat of ethical conflicts especially during interviews concerning competitors. Therefore it's mandatory to unveil all relevant information concerning one's identity and the purpose of the interview to the interviewee. To ensure high ethical standards all respectable MI companies are member of the global nonprofit membership organization of the Strategic and Competitive Intelligence Professionals (SCIP) and follow its code of ethics.

SCIP Code of Ethics for CI Professionals

- *To continually strive to increase the recognition and respect of the profession.*
- *To comply with all applicable laws, domestic and international.*
- *To accurately disclose all relevant information, including one's identity and organization, prior to all interviews.*
- *To avoid conflicts of interest in fulfilling one's duties.*
- *To provide honest and realistic recommendations and conclusions in the execution of one's duties.*
- *To promote this code of ethics within one's company, with third-party contractors and within the entire profession.*
- *To faithfully adhere to and abide by one's company policies, objectives and guidelines (SCIP, 2013).*

2.2.4 Analysis

In this phase the collected data and insights are evaluated in order to interpret this information in context of the need analysis. At the planning stage of a Market Intelligence process it’s very important to take into account that this is also the period of validation of the information. Therefore it’s necessary to plan enough time and financial resources for experts’ interviews during the analysis phase to double-check the results. In order to get comprehensible results it’s advisable to use standardized analysis techniques. Of those, most widely used are the following techniques:

- **Competitor profile:**
  The aim of a competitor profile is to establish a comparable summary of the business activities of one or more competitors. This detailed knowledge about ones competitors offers the possibility to compare it with the own

business model. This proactive knowledge can deliver valuable information how to improve the own strategy and how to react on competitors moves. Important for the comparability of competitor profiles is to use one suitable structure for all competitors based on standardized structures like the one below.

Table 1: Structure of a competitor profile (Source: "Competitive Intelligence", Michaeli, 2006).

Background	• location of offices, plants, online presences • key personalities, dates, events, trends • ownership, corporate governance, organizational structure
Financials	• P-E ratios, dividend policy, profitability • various financial ratios, liquidity, cash flow • profit growth profile, method of growth
Products	• products offered, depth and breadth of product line, product portfolio balance • new products developed, new product success rate, R&D strengths • brands, strength of brand portfolio, brand loyalty and brand awareness • patents and licenses • quality control conformance • reverse engineering
Marketing	• segments served, market shares, customer base, growth rate, customer loyalty • promotional mix, promotional budgets, advertising themes, advertising agency used, sales force success rate, online promotional strategy • distribution channels used (direct & indirect), exclusivity agreements, alliances, geographical coverage • pricing, discounts, allowances
Facilities	• plant capacity, capacity utilization rate, age of plant, plant efficiency, capital investment • location, shipping logistics, product mix by plan
Personnel	• number of employees, key employees, and skill sets • strength of management, management style • compensation, benefits, employee morale & retention rates
Corporate and marketing strategies	• objectives, mission statement, growth plans, acquisitions, divestitures • marketing strategies
SWOT-analysis	• Strengths: characteristics of the business or project that give it an advantage over others • Weaknesses: are characteristics that place the team at a disadvantage relative to others

	• Opportunities: elements that the project could exploit to its advantage • Threats: elements in the environment that could cause trouble for the business or project

- **PESTEL-Analysis:**

  PESTEL (Political, Economic, Social, Technological, Environmental and Legal) analysis describes six factors of influence concerning the on the macro level.

  - Political factors include the governmental measures that influence the economy like labor law, trade restrictions, tax policy, and environmental law.
  - Economic factors include economic growth, interest rates, exchange rates and the inflation rate.
  - Social factors include for instance population's growth rate and age profile, employment patterns, job market trends, and attitudes toward work.
  - Technological factors include technological aspects like level of technological advancement, infrastructure, and R&D activity.
  - Legal factors include for example advertising standards, consumer rights and laws, product labeling and product safety.
  - Environmental factors include climate, weather, geographical location, global changes in climate, environmental offsets (Johnson et al, 2011).

  These six factors give a rather detailed picture of the market environment in the investigated area. Therefore it’s often used to support the decision making process whether to enter a new market or not. In order to avoid an information overload it is recommendable to focus on the main influencing factors in each category.

Table 2: Example of a PESTEL-analysis of the aviation industry (Source: Johnson et al: Strategisches Management - Eine Einführung - Unternehmensführung: Analyse, Entscheidung und Umsetzung“, 2011.).

Political • Public subsidies for local airlines • Safety checks • Migration restrictions	**Economical** • National growth rates • Fuel prices
Social • A plus of travel activity of aged persons • International student exchange programs	**Technological** • More efficient engines and airplanes • Technologies for the implementation of safeguards
Environmental • Noise pollution • Control of the energy consumption • Demand for land of growing airports	**Legal** • M&A restrictions • Preferences for some airlines

- **Delphi method:**
  A systematic method used for instance for market forecasting and market trends analysis. Characteristically anonymous experts get closed questions to answer and have to justify their answers. After the first round of questions the moderator of this questioning analyses the answers and the justification and start at least a second round of adapted questions.
  This system of various rounds of questions and the analysis phase between enable the group of experts to arrive at a consensus forecast. The disadvantage of this method is the rather high time requirement and the lack of interaction between the experts and the resulting missing learning effect. The main advantage is the flexibility of time and place and the clear and consistent results (Pepels, 2007).

2.2.5 Deliverables

Market intelligence deliverables can be categorized according to service areas and different product types. The service areas are mainly differentiated by the time frame. There are ongoing services like the intelligence portal and market monitoring, whereas the rapid response research and the strategic analysis are project related. The intelligence products are mainly differentiated by the format and detail level (e.g. short market signals or briefings versus detailed analysis reports).

Table 3: Intelligence deliverables divided into four service areas and five product types. (Source: Hedin et al.: "The Handbook of Market Intelligence", 2011).

SERVICE AREAS:	INTELLIGENCE PRODUCT TYPES:
Continuous services:	Workshops
Intelligence portal	Briefings
Market monitoring	Analysis reports
Project services:	Profiles
Rapid response research	Market signals
Strategic analysis & advisory	

Continuous services:

- An intelligence portal is a software solution that offers the users the possibility either to store MI information or to extract it. Preferable it should be user-friendly enough to encourage different experts in all parts of the company to continuously use it. To ensure the quality and the structure of the stored data the intelligence portal must be controlled and edited by the MI team.
- Market monitoring delivers standardized market data on a daily, weekly or monthly base. Examples for these data are technology trends, new patents, Mergers and Acquisitions, sales figures and margins (Hedin et al., 2011).

Project services:

- A rapid response research is manly conducted to support the management in the preparation for internal or external meetings at very short notice. To be able to conduct a certain research within few days or even hours requires an already existing broad network of external experts and a deep knowledge of available cost effective secondary resources.

- Strategic analysis and advisory services shall support the strategic decision-making process within the Executive Committee of a company. Therefore not just a detailed and high qualified analysis is necessary, but also helpful advices for the strategic orientation of the company. For the self-understanding and role of an MI-team within a company it's crucial to establish this advisor position. Besides the own competence of the MI-team a direct contact with the higher management is essential for both, the information what kind of advice is requested at the very moment and the possibility to deliver this advice at the right addressee.

Intelligence product types:

- Workshops are often used to discuss and plan the implementation of the results of a strategic analysis. The collaborative structure of such a workshop also improves the future cooperation of the participants (especially MI-Team and decision-makers).
- Briefings are mainly used to update either a single person for a meeting or a large group (e.g. sales people) with a large amount of analytical findings.
- Analysis reports may be conducted continuously (e.g. quarterly), but mainly these reports are conducted spontaneously to serve a certain need. Possible applications are a new market entry, M&A, new arising competitors or new products on the market.
- Profiles are a structured part of the market monitoring. Mainly used to have a comparable picture of a company, region or product.
- Market signals used to be unprocessed data like product prices, which were continuously and directly put into the intelligence portal. In the last years more and more MI teams started to add analytical comments even to this single pieces of information to enrich its value for the company (Hedin et al., 2011).

2.2.6 Utilization and feedback

The utilization and feedback phase marks both the end of an intelligence cycle and the beginning of a new one. The analyzed information can now be integrated for instance in the strategic decision making process or in the sales process. Overall there are five basic targets for the utilization process:

1. Identifying of new business opportunities
2. Ideas sharing
3. Improving of the organization's ability to anticipate surprises
4. Improving of managers' analytical skills
5. Integrating of diverse ideas (Gilad, 1989)

The experience made during the whole intelligence cycle leads to the final feedback from both the MI team and the addressees. This feedback leads to the optimization of the cooperation and the identification of new needs for future MI-projects.

2.3 MARKET INTELLIGENCE SOFTWARE

To establish a continuing and high quality MI-service within a company it's necessary to use tools and techniques to facilitate the collecting, storage, analyzing and the delivering of the needed information. The main tool is the software to store the collected and processed information and to distribute it, an intelligence portal.

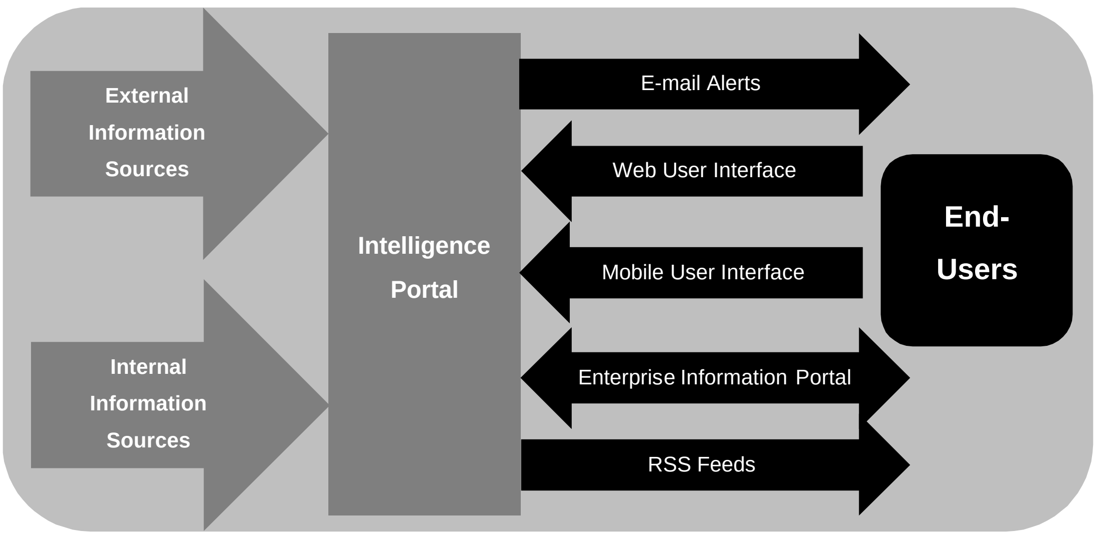


Figure 5: Function of the intelligence portal (Source: Hedin et al: "The Handbook of Market Intelligence", 2011).

The design of an intelligence portal strongly varies because of the special needs of the different companies. Nevertheless there are some common must have features of a Market Intelligence software.

Table 4: Most important features of a MI-software (Source: Hedin et al: "The Handbook of Market Intelligence", 2011).

Dissemination: • Automated, personalized email alerts to the users • Newsletter generator and group email functionalities • Integration of external user interfaces (API,XML,RSS,SharePoint)	**Collaboration:** • Commenting on content items • Discussion forums and/or threads • User groups and facilitation of networking
Data sourcing and input features: • Web crawling or monitoring • RSS feed management • Input through a web interface • Input through a smart phone interface • Ability to do microblogging and use shoutboxes • Integration with external data sources (customer relationships management, enterprise resource planning, application programming interface)	**Self-service access:** • Dashboards of content that can be customized • Sophisticated search tools • Analysis tools for text-based content (news trends, tag clouds, text-mining, semantic analysis) • Analysis tools for quantitative data (e.g. charting) • Benchmarking (products, companies, markets) • Smartphone user interface and application
Security: • Secure authentication and authorization • Encrypted data storage/transfer • Granular access rights of users • Single sign-on to save the user from the trouble of logging in separately to the intelligence portal	**Content management features:** • Storing content in a database and adding metadata • Categorization of content (taxonomy) • Searching and indexing • Automatic translation • Usage monitoring and statistics

The intelligence portal fulfills besides the support function for the storage and the processing of the data one major role as network. Not only a passive data and analysis extraction must be possible for the users, but an active commenting and adding of ideas and suggestions. Because of this possibility to actively participate in the MI program the users will be more willing to share their knowledge and needs. This helps on the hand to increase the acceptance of the Market Intelligence program within the company and on the other hand to improve the quality of the program.

2.4 INTEGRATION OF MARKET INTELLIGENCE INTO THE CORPORATE STRUCTURE

Besides a professional intelligence process and a sophisticated MI-software the integration of the Market Intelligence program into the corporate structure is essential for developing its full potential (Weber et al, 2008). Despite all the variances that may occur because of the different conditions of diverse companies there are five main elements of a successful integration of the MI-program into the corporate structure:

- MI-Leadership: The sponsor of the MI-program should be part of the top management of the company. Depending on the main focus of the program this could be either the head of the strategic or the sales department. This also guarantees the direct delivery of the actual needs and vice versa the results of the analysis to the right addressees.
- MI-Team: Besides the quality of the results produced by the MI-team it's very important for the acceptance and integration of the MI program that at least the team leader is a great networker. Depending on the already existing structure of the company the MI-team can either be centralized or decentralized, but in any case the MI-team has to establish an internal and an external MI-network to become an integral and vital part of the company.
- Internal MI network: A network of experts in the different divisions of the company, which are willing to share their insides. In addition to the extra knowledge this network should strengthen the position of the MI-team as source of information and advice.

- External information source network: A network of MI- and other relevant experts in other companies and industries. This offers the possibility to benchmark the own attempt with external experts and to be not only the major link to the internal expertise, but also to external experts.
- External information source portfolio: A standardized and continuous information portfolio decreases the related purchase costs and helps to establish a continuous reporting. High quality and regular reports increase the awareness of the MI-program and accelerate acceptance of the program as part of the corporate structure (Hedin et al., 2011).

2.5 SUMMARY OF THE DEFINITION AND THE APPROACH OF MARKET INTELLIGENCE

The scope of Market Intelligence is very broad. It covers the whole internal and external business environment of a company. In other words Market Intelligence shall provide the decision makers in a company with all relevant market information to support the decision making process. To fulfill all these tasks and provide satisfying result a well-structured approach is essential. Therefore the market intelligence process was established, starting with the needs analysis to identify the involved persons, the topics, and the format of the expected deliverables, the budget and the timeframe.

The next step is the secondary research in which already available sources like studies, company reports and data bases are used to find the needed data. Depending on the expected results a secondary research alone can deliver sufficient data for the analysis or an additional primary research is necessary.

The primary research offers a more customized data research than a secondary research. A direct questioning of customers, competitors or market experts can deliver exactly the needed answers to the KIQs. The main types of questioning are the personal interview, trade show and conference intelligence, telephone interview, and the online survey.

The next step is the analysis phase during which the collected data and insights are evaluated in order to interpret this information in context of the need analysis. In order to get comprehensible results it’s advisable to use standardized analysis techniques like the competitor profile, the PESTEL (Political, Economic, Social, Technological, Environmental and Legal) analysis, and the Delphi method. The analysis phase leads to Market Intelligence deliverables.

Market intelligence deliverables can be categorized according to service areas and different product types. The service areas are mainly differentiated by the time frame. There are ongoing services like the intelligence portal and market monitoring, whereas the rapid response research and the strategic analysis are project related. The intelligence products are mainly differentiated by the format and detail level (e.g. short market signals or briefings versus detailed analysis reports).

The utilization and feedback phase marks both the end of an intelligence cycle and the beginning of a new one. The analyzed information can now be integrated for instance in the strategic decision making process or in the sales process. The experience made during the whole intelligence cycle leads to the final feedback from both the MI team and the addressees. This feedback leads to the optimization of the cooperation and the identification of new needs for future MI-projects.

To establish a continuing and high quality MI-service within a company it's necessary to use tools and techniques to facilitate the collecting, storage, analyzing and the delivering of the needed information. The main tool is the software to store the collected and processed information and to distribute it, an intelligence portal. The intelligence portal fulfills besides the support function for the storage and the processing of the data one major role as network. Besides a professional intelligence process and a sophisticated MI-software the integration of the Market Intelligence program into the corporate structure is essential for developing its full potential. To successfully integrate the MI-program a close connection to the top management, a well-functioning internal and external network, and a well-trained MI-team are essential.

3 STAUS QUO AND DEVELOPMENT OF THE RENEWABLE ENERGY MARKET IN THE EU

3.1 SOLAR ENERGY

3.1.1 Market Status

Since most of the renewable energy companies focus on one special technology this short overview of the status quo and the development of the renewable energy market in the EU is separated in the main energy sources and technologies in this market. In the field of solar energy the main technologies investigated are photovoltaics, solar thermal and concentrated solar power.

3.1.2 Photovoltaic

Germany was the main driver of the growth of the photovoltaic market in the EU during the last decade. In the recent years Italy, Spain and France became also important growth-driver.

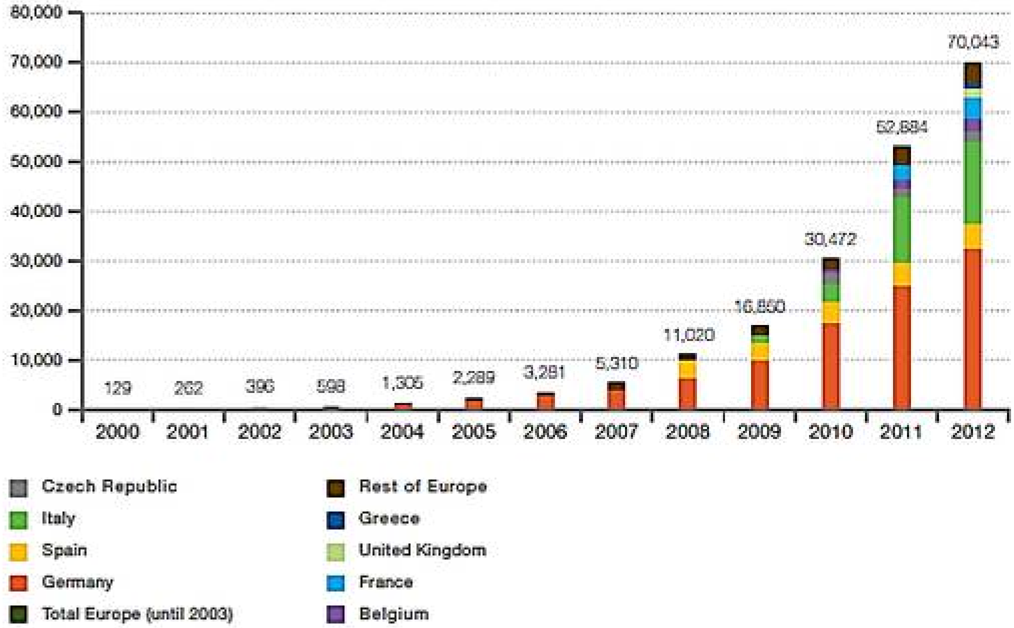


Figure 6: Evolution of European cumulative installed PV capacities 2000-2012 in MW (Source: Global Market Outlook for Photovoltaics 2013-2017, EPIA, 2013).

In 2012 the growth of installed PV capacities slowed down to 17.159 MW in comparison of the 22.412 MW in the year 2011. The main reason for this slowdown was the fear of several governments within the EU of exploding costs of the public subsidies for PV in a, due to the financial and economic crisis already extremely difficult economic environment and as a result the introduction of new taxes and the reduction of the subsidies (EurObserv'er, 2013). An additional factor was that quite some countries have already reached their, obviously not that ambitious National Renewable Energy Action Plan 2020 targets and consequently the public pressure for new PV installations was not that high any more.

Table 5: NREAPs vs. reality of PV markets in the EU 27 in MW (Source: Global Market Outlook for Photovoltaics 2013-2017, EPIA, 2013).

	Cumulative installed capacity in 2012	NREAPs' 2020 target for PV	Necessary yearly market until 2020	Target reached in...	Market in 2011	Market in 2012
Austria	418	322	n/a	reached in 2012	92	230
Belgium	2,650	1,340	n/a	reached in 2011	996	599
Bulgaria	908	303	n/a	reached in 2012	105	767
Czech Republic	2,072	1,695	n/a	reached in 2010	6	113
Denmark	394	6	n/a	reached in 2010	10	378
France	4,003	4,860	107.1	2013-2014	1,756	1,079
Germany	32,411	51,753	2417.8	2016-2020	7,485	7,604
Greece	1,536	2,200	83	2013-2014	426	912
Hungary	4	63	7.4	2013-2015	2.5	n/a
Italy	16,361	8,000	n/a	reached in 2011	9,454	3,438
Netherlands	266	722	57	2014-2016	58	125
Poland	7	3	n/a	reached in 2012	1	4
Portugal	244	1,000	94.4	2016-2020	47	49
Romania	30	260	28.7	2013-2016	1.6	26
Slovakia	523	300	n/a	reached in 2011	321	15
Slovenia	198	139	n/a	reached in 2012	46	117
Spain	5,166	8,367	400.2	2016-2020	472	276
Sweden	19	8	n/a	reached in 2011	4	8
United Kingdom	1,829	2,680	106.4	2013-2014	813	925
Rest of EU 27*	62	360	37.3	2016-2020	22	7
Total EU 27	**69,100**	**84,381**	**1910.12**	2013-2014	**22,117**	**16,672**

* Rest of EU 27 includes Cyprus, Estonia, Finland, Ireland, Latvia, Lithuania, Luxembourg and Malta.

Target already reached in 2010-2012: Country has significantly underestimated PV's potential.
Target to be reached by 2013-2015: Country has underestimated PV's potential.
Target to be reached by 2016-2020: Country has either properly estimated PV's potential (Germany) or has set measures constraining the market to meet the set target not earlier than 2020 (Netherlands, Portugal, Spain).

One special characteristic of the PV market is the involvement of residentials. Of all renewable energies only the solar thermal market offers a comparable possibility for private house owners to actively participate in the renewable energy sector at the moment. The level of commitment of private house owners strongly varies in the EU countries. In Denmark, Belgium and the Netherlands the share of residential segment was over 80% in 2012. The ground-mounted segment dominated the Bulgarian and the Portuguese market, whereas the commercial segment was very strong in Slovakia, Austria and Sweden.

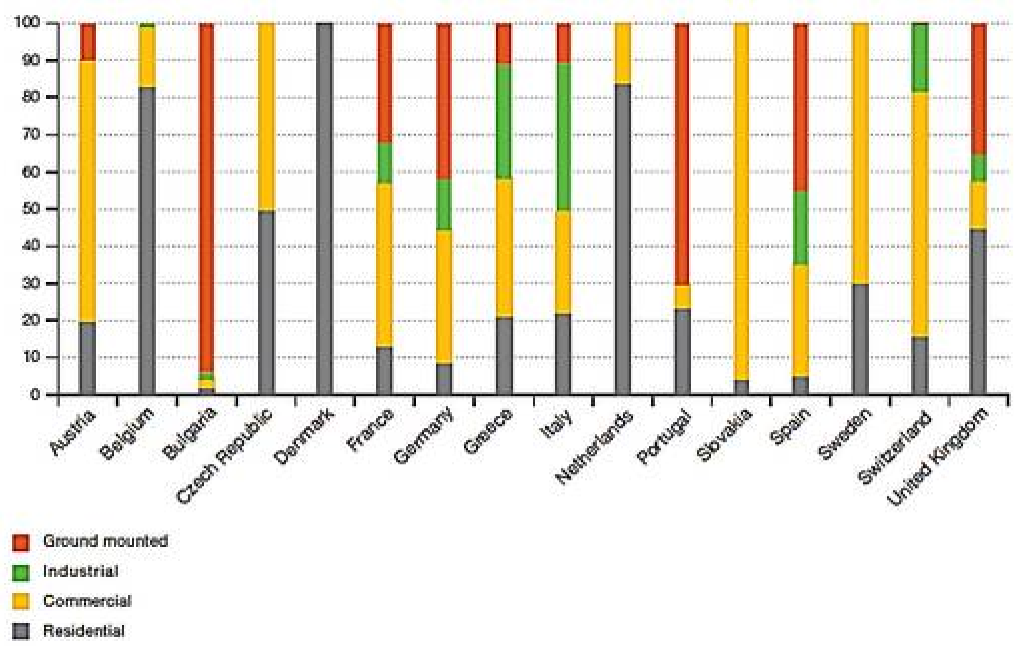


Figure 7: European PV market split in 2012 in % (Source: Global Market Outlook for Photovoltaics 2013-2017, EPIA, 2013).

3.1.3 Solar thermal

The solar thermal market is also suffering under the difficult economic climate.

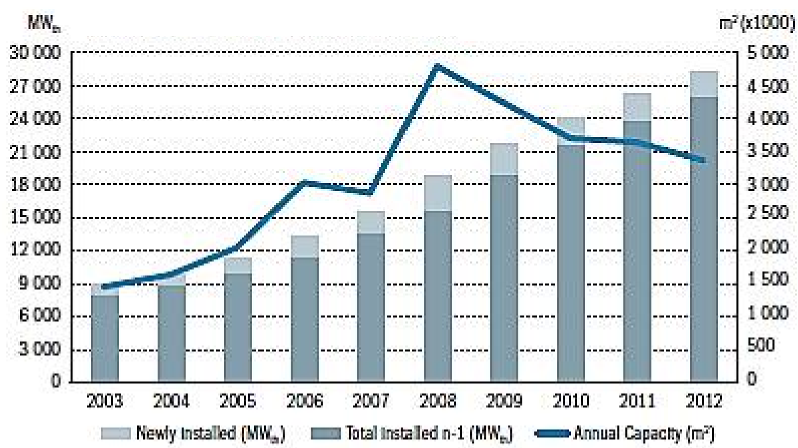


Figure 8: Solar Thermal Market in EU27 and Switzerland-Total and new installed Capacity (glazed collectors) (Source: Solar Thermal Markets in Europe-Trends and Market Statistics in 2012, ESTIF, 201 3).

While the total installed capacity increased with 2 GWth or 7.7% to 28.3 GWth in 2012, the annual increase dropped by 6.4% compared to 2011. This continues the downward trend after 2008 and its record level of 3.36 GWth installed in this year. In this connection even the extremely positive trend in smaller markets like Hungary (+150%) and Denmark (+81.1%) in 2012 couldn't compensate the losses in the main markets like Germany (-9.4%) and Italy (-15.4%) (ESTIF, 2013).
Besides the financial and economic crisis and the associated stagnation of the building sector is the competition with other technologies like PV and heat pumps the main reason for the slower increase of new installed capacities. Due to the still relatively high purchasing costs for an average household it's more and more an either or decision between PV and solar thermal with the better end for PV (EurObserv'er, 2013).

Table 6: Market size in terms of Solar Thermal Capacity (KWth) and in terms of Collector area (m²) (Source: Solar Thermal Markets in Europe-Trends and Market Statistics in 2012, ESTIF, 2013).

	Market (=Newly Installed)							In Operation[7]		
	2010	2011	2012				Annual Evolution of the Market	End of 2012		Annual Evolution of the Total Installed Capacity
	Total Glazed	Total Glazed	Flat Plate	Vacuum Collectors	**Total Glazed**	**Total Glazed**	Total Glazed	Total Glazed		Total Glazed
	m²	m²	m²	m²	m²	**kW(th)**	%	m²	**kW(th)**	%
Austria	279 898	243 285	200 800	5 590	206 390	**144 473**	-15.2%	4 108 338	**2 875 837**	2.7%
Belgium	42 500	45 500	50 500	11 500	62 000	**43 400**	36.3%	384 533	**269 173**	18.9%
Bulgaria	8 400	10 800	7 400	600	8 000	**5 600**	-25.9%	122 100	**85 470**	6.1%
Cyprus	30 713	28 437	22 373	1 544	23 917	**16 742**	-15.9%	707 776	**495 443**	-0.8%
Czech Republic	91 717	65 800	37 000	13 000	50 000	**35 000**	-24.0%	427 327	**299 129**	12.8%
Denmark	64 651	62 401	112 500	500	113 000	**79 100**	81.1%	682 345	**477 642**	16.9%
Estonia*	500	1 800	900	900	1 800	**1 260**	-	6 520	**4 564**	-
Finland*	3 700	4 000	3 000	1 000	4 000	**2 800**	-	36 723	**25 706**	-
France	256 000	251 000	240 750	8 750	249 500	**174 650**	-0.6%	2 074 400	**1 452 080**	13.7%
Germany	1 150 000	1 270 000	1 036 000	114 000	1 150 000	**805 000**	-9.4%	16 049 000	**11 234 300**	7.0%
Greece	214 000	230 000	241 500	1 500	243 000	**170 100**	5.7%	4 119 200	**2 883 440**	0.8%
Hungary	21 000	20 000	35 000	15 000	50 000	**35 000**	150%	219 814	**153 870**	29.4%
Ireland	52 966	59 349	18 803	8 284	27 087	**18 961**	-54.4%	270 769	**189 538**	11.1%
Italy	490 000	390 000	287 900	42 100	330 000	**231 000**	-15.4%	3 365 730	**2 356 011**	10.4%
Latvia*	200	1 800	150	150	300	**210**	-	4 040	**2 828**	-
Lithuania*	200	1 800	600	1 200	1 800	**1 260**	-	6 000	**4 200**	-
Luxemburg*	4 500	4 500	3 250	900	4 150	**2 905**	-	39 800	**27 860**	-
Malta*	5 000	5 980	5 500	480	5 980	**4 186**	-	57 820	**40 474**	-
Netherlands	40 834	33 000	42 470	0	42 470	**29 729**	28.7%	509 065	**356 346**	7.3%
Poland	145 906	253 500	216 000	86 000	302 000	**211 400**	19.1%	1 211 390	**847 973**	33.2%
Portugal	182 271	127 198	90 121	491	90 612	**63 428**	-28.8%	856 867	**599 807**	9.7%
Romania	15 500	15 500	8 500	7 000	15 500	**10 850**	0%	110 700	**77 490**	5.2%
Slovakia	15 000	23 000	6 500	1 000	7 500	**5 250**	-67.4%	147 000	**102 900**	3.3%
Slovenia	11 000	12 000	13 500	3 000	16 500	**11 550**	37.5%	186 800	**130 760**	6.6%
Spain	336 800	266 979	213 060	12 623	225 683	**157 978**	-15.5%	2 587 162	**1 811 013**	9.2%
Sweden	20 699	20 807	8 251	3 006	11 257	**7 880**	-45.9%	345 731	**242 012**	2.6%
Switzerland	144 772	137 863	125 000	17 000	142 000	**99 400**	3.0%	1 145 431	**801 802**	12.1%
United Kingdom	105 200	91 778	47 893	11 382	59 275	**41 493**	-35.4%	709 673	**496 771**	8.0%
EU27 + Switzerland	3 733 927	3 678 077	-	-	3 443 721	**2 410 605**	-6.4%	40 494 094	**28 345 866**	7.7%

3.1.4 Concentrated solar power

The CSP market in the EU witnesses a steady growth since 2007- almost exclusively driven by Spain. Spain has not only the most CSP-plants (43 plants in operation by end of 2012), but it has also the only large scale plants (= 10 MWe) and the only well-established production industry in the EU.

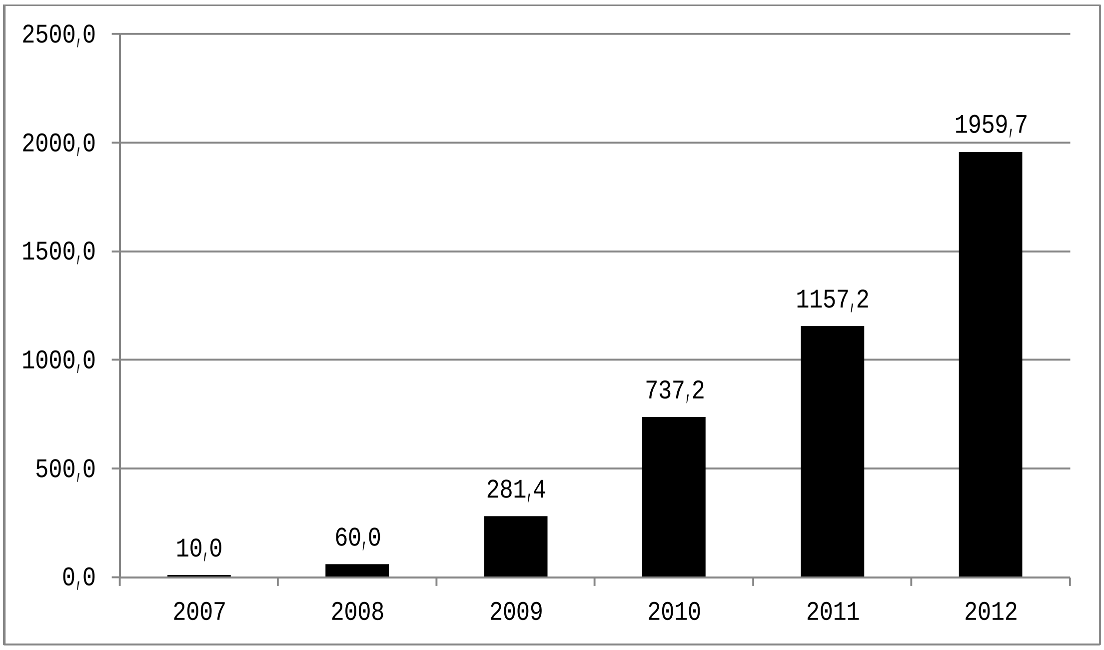


Figure 9: European Union CSP capacity trends in MWe (Source: Solar Thermal and Concentrated Solar Power Barometer, EurObserv'er, 2013).

France and Italy, the two other countries with CSP-plants have so far only prototypes. These prototypes, Archimede (5 MWe) in Italy and Augustin Fresnel (0.25 MWe) and La Seyne-sur-Mer (0.5 MWe) in France contribute together 5.75 MWe to the total of 1959.7 MWe in operation at the end of 2012. 2013 is estimated to be the year of a major change in this until 2012 so prospering market. Due to several austerity measures taken by Spain since 2012 and the rather slow entering of France and Italy in the large scale CSP-plant market, the CSP-market in the EU is expected to grow far slower than in the recent years (EurObserv'er, 2013).

3.1.5 Political environment

The political environment has a great impact on the development of solar energy in the EU. Besides the financial support, the increase of planning security for both companies and the public funding bodies is the most important factor in the European Renewable Energy 2020 strategy. At moment it is expected that only in the field of PV the set targets can be reached by 2020 or even earlier.

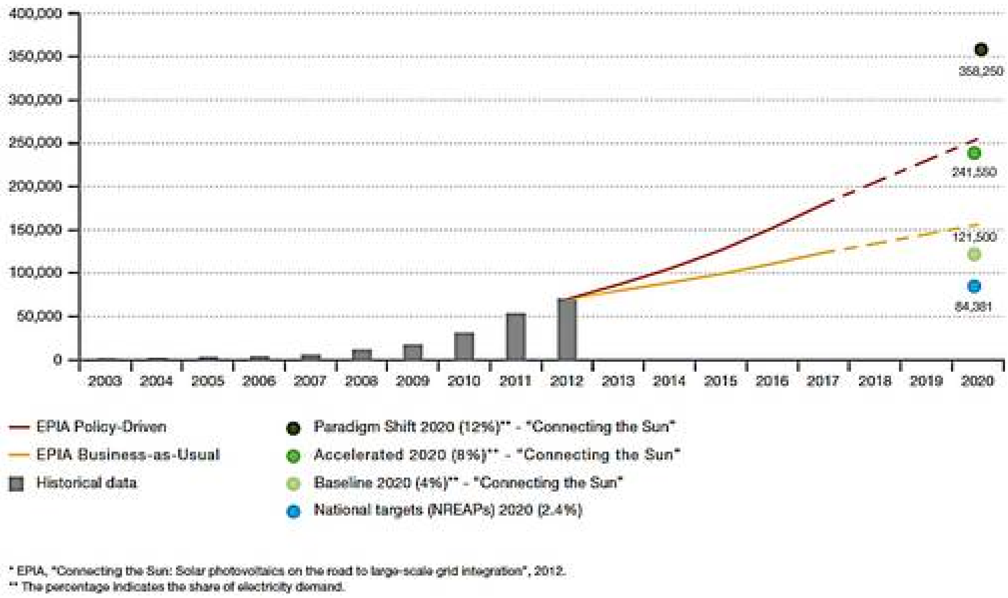


Figure 10: European PV cumulative capacity forecasts compared with EPIA's new 2020 scenarios and NREAPs targets in MW (Source: Global Market Outlook for Photovoltaics 2013-2017, EPIA, 2013).

The European Photovoltaic Industry Association predicts that even in a Business-as-Usual scenario (no additional political support) the cumulative capacity of PV in the EU in 2020 will be about twice as high as the levels foreseen in the NREAPs. With a more ambitious political support (Policy-Driven scenario) even a tripling could be possible (EPIA, 2013).

On the other hand, a too ambitious political support bears also the risk of overheating the market. The PV-market in the Czech Republic is a good example that a very attractive public support and the decrease of the purchasing costs of photovoltaic modules can trigger a PV boom and at the same time crush the market for years. The boom started in 2007 and reached its peak in the year 2010 with a growth of about 1200 kWp-at this time the third highest PV installed capacity in the world. *"In February 2010, the CEPS (Czech Transmission Grid Operators)* *proscribed the interconnection of all new PV plants to the grid in the Czech Republic*" (Dorda, 2012) as consequence of the exploding funding costs. The market was closed till begin of 2012 and is expected to recover slowly over the next years (EPIA, 2012).

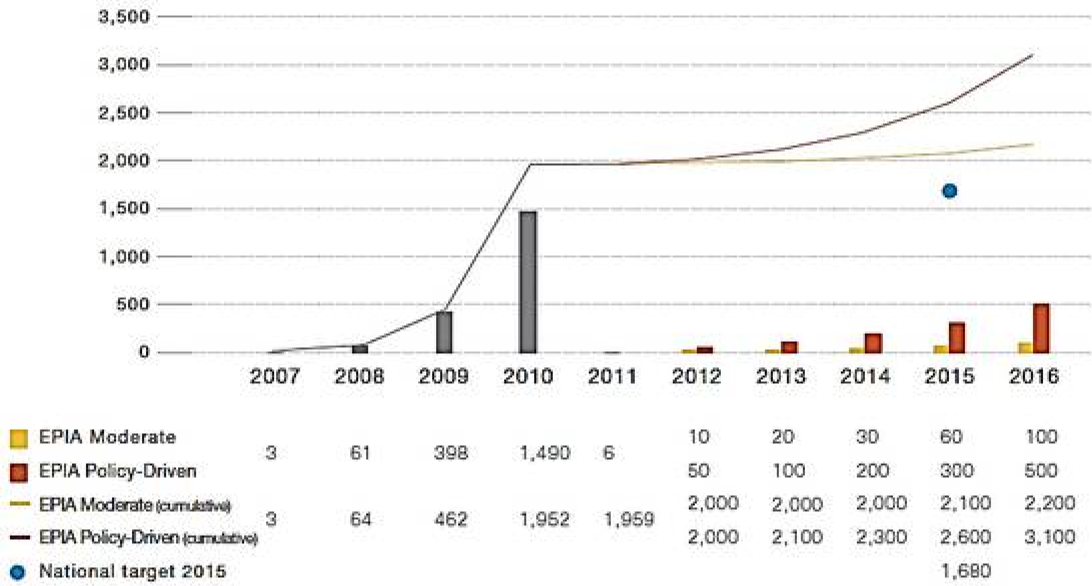


Figure 11: PV boom and bust in Czech Republic (Source: Global Market Outlook for Photovoltaics until 2016, EPIA, 2012).

The public support and its schemes in the European Union vary widely from one Member State to another. Investment grants, Feed-in tariffs and Green certificates are most widespread. Not only are the support systems different from country to country, also the amount of money invested by the individual Member States of the European Union per MWh deviate very strongly from each other. According to the Council of European Energy Regulators the maximum support granted for photovoltaics in 2011 was 543.43€/MWh in Luxembourg. The minimum support in 2011 was 78.74€/MWh in Romania, but this meant with +43.6% also the second highest increase compared to 2011 after the UK with +45.45%.

Table 7: Weighted average support level for PV 2010-2011 (€/MWh) (Source: CEER: "Status Review of Renewable and Energy Efficiency Support Schemes in Europe", CEER, Bruxelles, 2013).

Member state	2010	2011	Change
Austria	295.40	263.64	-10.76%
Belgium	420.67	407.42	-3.15%
Czech Republic	435.83	432.33	-0.80%

France	496.03	477.22	-3.79%
Germany	387.92	353.82	-8.79%
Italy	406.80	367.20	-9.73%
Luxembourg	415.15	543.43	+30,90%
Netherlands	389.68	385.88	-9.75%
Portugal	291.10	291.78	+0.23%
Romania	55.00	78.74	+43.16%
Slovenia	350.88	343.07	-2.17%
Spain	399.93	356.76	-10.79%
UK	199.63	290.37	+45.45%
Minimum support	55.00	78.74	+43.16%
Maximum support	496.31	543.43	+9,49%

Besides the different support schemes and NREAPs, the varying effects of the economic crisis on individual Member States of the European Union are the biggest difference between the Member States. For example in Spain the direct consequences of the economic crisis was a reduction of energy demand to 2001 levels and the electricity demand to 2006 levels. The resulting overcapacity on the Spanish electricity market and the tariff deficit of more than €28 billion forced the Spanish government to enforce a moratorium on new renewable energy installations in January 2012. Furthermore, the Spanish government established several retrospective measures like a 7% tax on the sale of electricity. These measures economically destroyed several smaller renewable energy projects or prevented their implementation and undermined the credibility and reliability of the Spanish renewable energy market (EREC, 2013).

While the economic crisis and the related cuts in public spending slowed down the growth of the photovoltaic capacity without endanger the EU wide 2020 targets, it slowed down the development of the CSP and solar thermal market to such extent that it’s not expected anymore that these markets can achieve the common 2020 targets. Since the CSP-market is dominated by Spain the above mentioned measures strongly affect also this market. After a growth from 1157.2 MWe in 2011 to 1959.7 MWe in 2012 the further development of the CSP-market is expected to slow down. According to an estimation of L’Observatoire des énergies renouvelables the market will grow till 2015 to 2470 MWe far behind the NREAPs target of 3573 MWe. The discrepancy in the year 2020 will consequently be even worse: the expected 4000 MWe would represent a gap of 3044 MWe to the 2020 target of 7044 MWe.

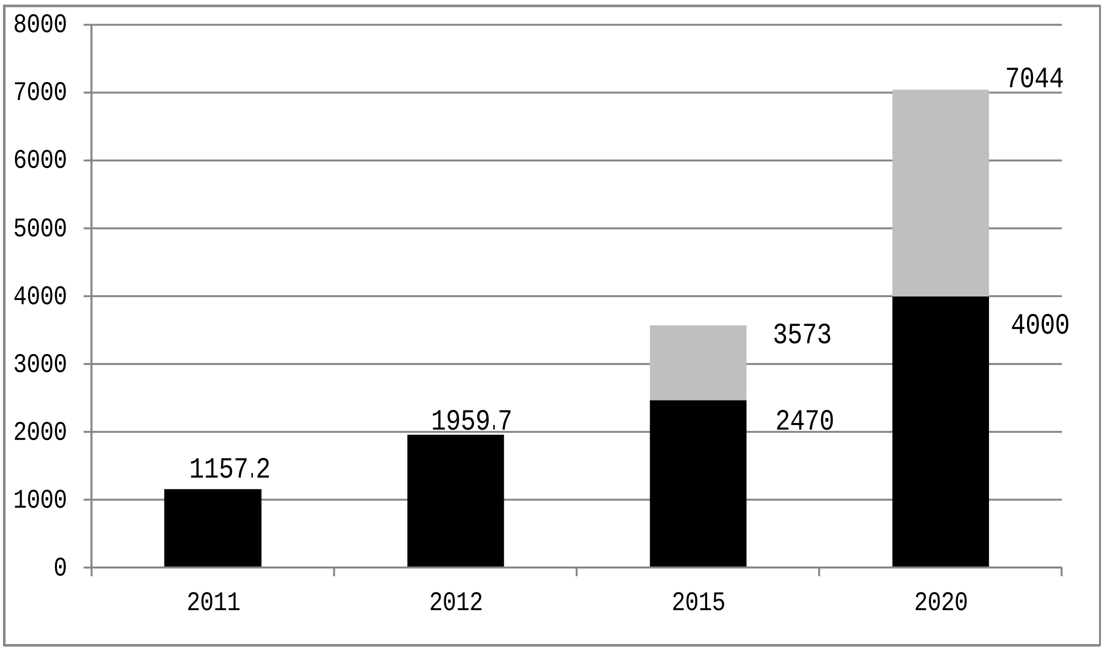


Figure 12: Comparison of the CSP current trend against the NREAP roadmap in MWe (Source: Solar Thermal and Concentrated Solar Power Barometer, EurObserv'er, 2013).

The situation of the solar thermal market in the EU is similar to the CSP-market – slowdown and missing the 2020 by far. Two EU-regulations represent a light at the end of the tunnel and could help the solar thermal market to still reach the 2020 targets. Number one is the EU directive on energy efficiency (2012/27/EU), which forces the Member States to have a 20% increase in energy efficiency in the building sector. The second is the directive 2010/31/EU on Energy Performance of Building, which forces the Member States to ensure that an equivalent of 1.5% of annual energy sales is saved through energy efficiency measures. It also states in Article 9 that: (*a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and (b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings* (EUR-Lex, 2010).
These two measures could increase the demand of solar thermal solutions on the long term, but if this support will be enough to achieve the 2020 targets is doubtfully. According to an estimation of L'Observatoire des énergies renouvelables the market will grow till 2015 to 2156 MWe far behind the NREAPs target of 3019 MWe. The discrepancy in the year 2020 will consequently be even worse: the expected 3125 MWe would represent a gap of 3223 MWe to the 2020 target of 76348 MWe.

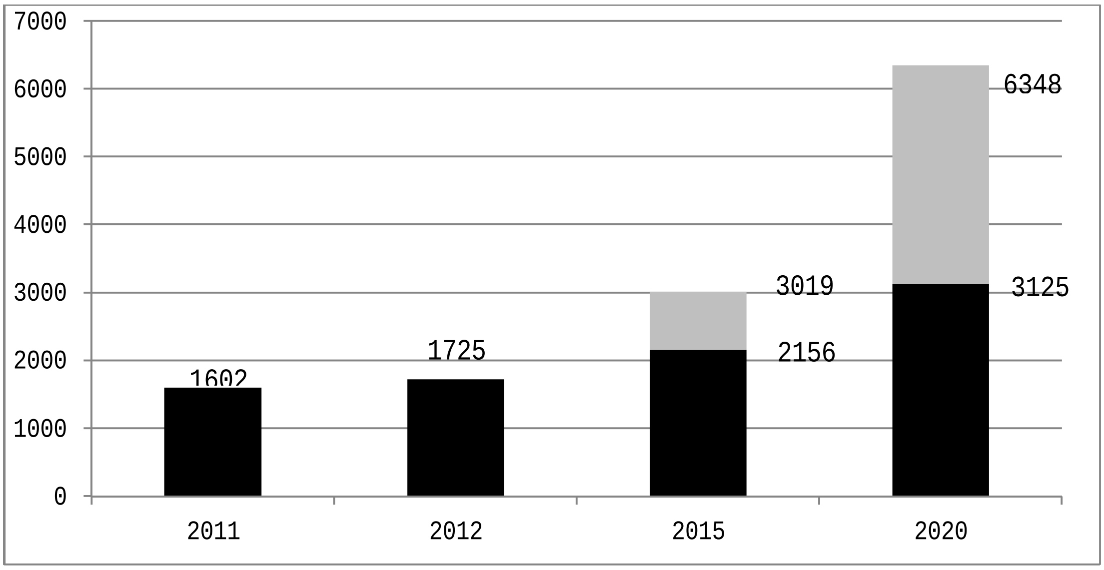


Figure 13: Comparison of the solar thermal current trend against the NREAP roadmap in MWe (Source: Solar Thermal and Concentrated Solar Power Barometer, EurObserv'er, 2013).

3.1.6 Trends

Besides the changes in the public support system, the decrease of the purchasing costs for solar energy equipment, the shrinking importance of Europe as supplier of PV-modules and its market, and new technologies arising are the main trends in the field of solar energy.

Cost Reduction:

During the last year the price of PV modules witnessed a tremendous decrease.

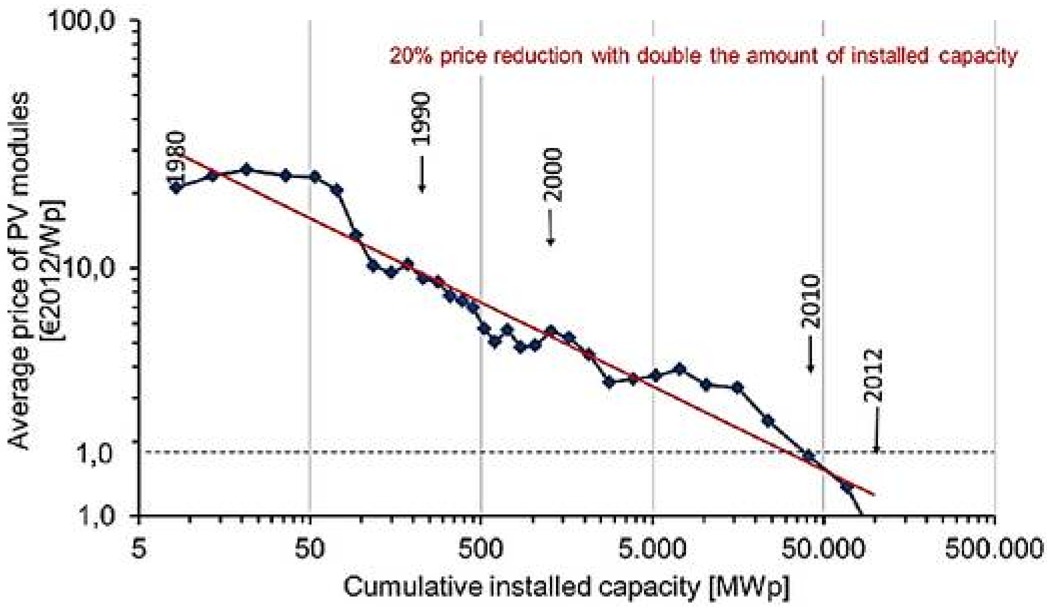


Figure 14: Historical price development of PV modules (Source: Recent facts about photovoltaics in Germany, Fraunhofer ISE, 2013).

The recent developments in the production progress and economies of scale (each doubling the cumulative installed capacity in the last decades meant also a 20% price-reduction) led to a decrease of investment costs of 15% per year. Another reason for the price decline was the overcapacity in the module production. From 2009-2012 the annual global module production capacity was 150-230% higher than the installations. The main reason for this overcapacity was the attempt of new producers entering the market with the aim to increase their market share as soon as possible (EPIA, 2013).

For the solar thermal market even a learning curve factor of 23% is estimated. This could result in production costs for solar thermal collectors in 2020, which represent just 57% of what it used to be in 2010.

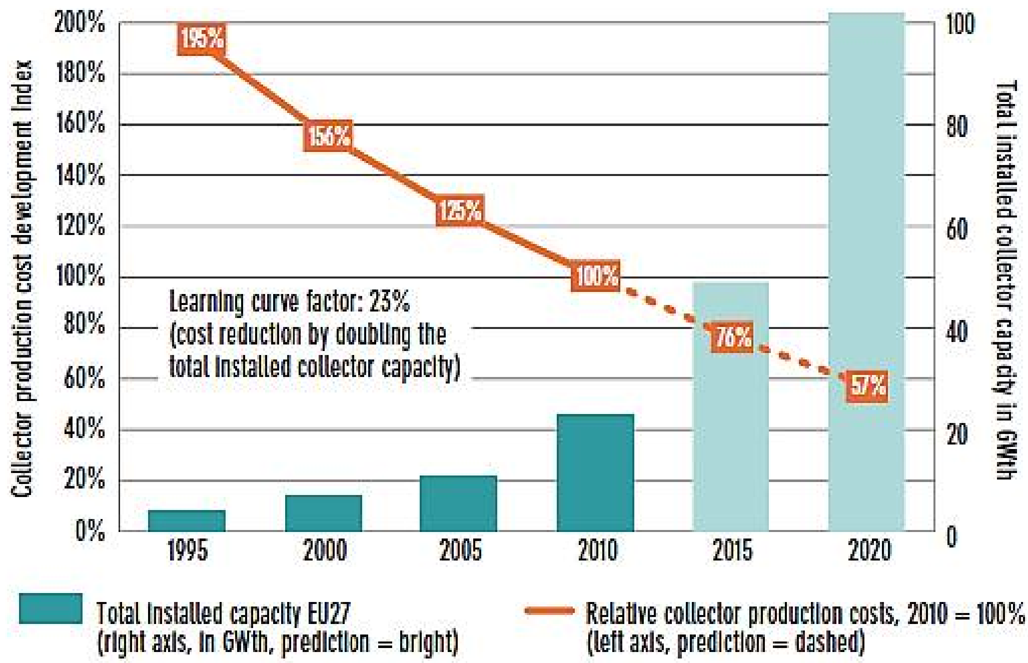


Figure 15: Collector production costs and market evolution 1995-2010 (Source: Solar Thermal Markets in Europe-Trends and Market Statistics in 2012, ESTIF, 2013).

Despite the increasing concurrence from the more and more affordable PV-modules also CSP plants are expected to become more cost effective. According to A.T. Kearney the minimum required tariff for CSP will decrease to 50-65% in the year 2015 and to 45-60% of the 2012 level till 2025.Technological improvements like increased mirror size and accuracy, higher operating temperatures, and increased turbine efficiency are expected to support this development. Additional cost reduction of the CSP-Industry in the planning, engineering and construction phase and increased cooperation between the players all along the value chain shall further contribute to the cost reduction.

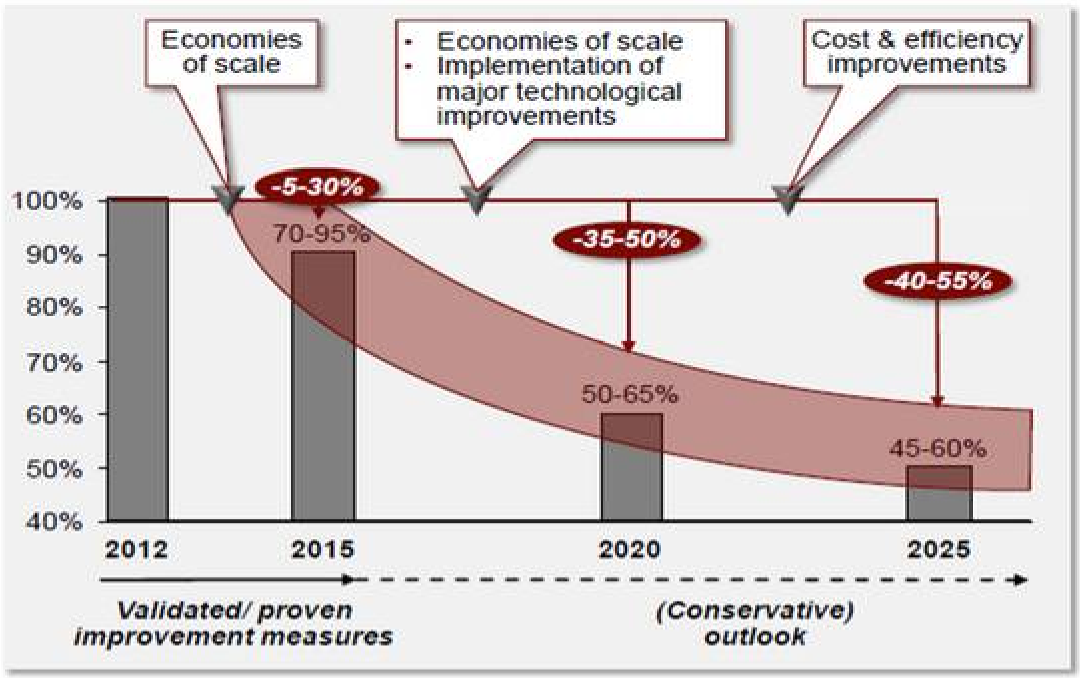


Figure 16: (Expected tariff development 2012-2025- in & compared to reference plants 2012, excl. impact of DNI (Source: CSP Cost Roadmap Study, A.T. Kearney, 2010).

Shrinking importance of Europe:

During the last years the European Union witnessed a decrease in its importance as production place and market for photovoltaic modules. After the tremendous, mainly driven by Germany, rise of Europe's global PV-market share from under 20% in 2000 to over 80% in the year 2008 followed the decline intensified by the impact of the financial and economic crisis. In 2012 Europe represents just 55% of the global PV-market. In parallel importance as production place for photovoltaic modules of Europe declined from a 30% share in 2008 to 13% in 2012. In the meantime Chinas market share increased from 5% in 2000 to 20% in 2012 and its share of the global production from about 2 % in 2000 to 60% in the year 2012. This tremendous increase of the production capacity was supported by the Chinese government with public subsidies and therefore led to a dispute with the EU. As a result an agreement came into effect on 6 August 2013, which sets according to unofficial sources a minimum price for Chinese products of 56 cents for every watt peak capacity of a solar panel (Kohoutek, 2013). "*The minimum price, as set, applies to the first 7 gigawatts of capacity sold in the EU. Beyond that level, importers of Chinese solar panels will pay 47.6 per cent duty" (Dentons, 2013).*

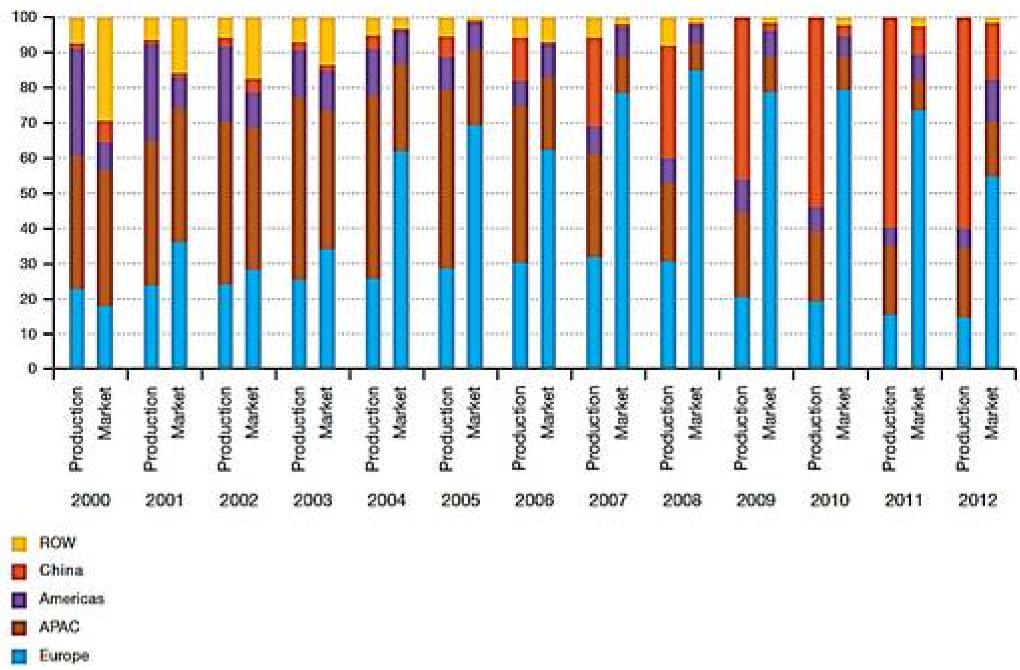


Figure 17: Historical PV market vs. production by region (%) (Source: Global Market Outlook for Photovoltaics 2013-2017, EPIA, 2013).

New technologies:

In all three main technologies of the solar energy market ongoing technological improvements are expected. Since the performance of PV-Cells is still rather low the main improvements will probably occur in this field. Up till now the efficiency of the best current commercial module is around 19-20% (with a target of 23% by 2020) (IEA-ETSAP and IRENA, 2013). Research institutes all over the world try to increase this efficiency to 50%. In September 2013 the Fraunhofer Institute for Solar Energy Systems ISE, Soitec, CEA-Leti and the Helmholtz Center Berlin jointly reached under laboratory conditions a new record efficiency of 44.7% using a new solar cell structure with four solar subcells (Fraunhofer ISE, 2013). Besides the attempts to increase the efficiency the research for further application possibilities of PV is the main technological trend. On February 1, 2013, Sunpartner received the title of "Nobel Sustainability® Supported Clean Tech Company 2013" for its "*WYSIPS technology (What You See Is Photovoltaic Surface), a revolutionary component developed by Sunpartner, capable of transforming any medium (e.g.*

screens and displays, windows, and facades) into a solar energy-producing surface" (Sunpartner, 2013).
The combination of higher efficiency and further application possibilities of PV could trigger a PV boom in the next years.

3.1.7 Market intelligence perspective

A short market overview can be the base for MI-strategy of a company. It shows the overall market development, the main trends and the market forces. This can help companies to evaluate how important an own MI-program could be and where the focus of such a program should be. The short solar energy market overview for example showed that this is a very dynamic market and dependent on political support and will remain so in the near future. In such a market environment a proactive strategy and quick reaction on market developments is necessary for economic success. A tailor-made MI-program could deliver the needed information and the advices for such an efficient and prompt acting decision making process. To establish such a program one of the first steps is the need analysis and therefore to define the Key Intelligence Topics and the Key Intelligence Questions for the own company in this special market.
Despite the fact that depending on the position of the relevant company in the value chain in the solar energy market the focus of a MI-program will vary, there are some common KITs and KIQs.

Key Intelligence Topics:

1. Market growth and trends
2. New product developments
3. General political and regulative environment and in particular the public support
4. Customer behavior and product awareness
5. Competitor strategies and product and service portfolio

Key Intelligence Questions:

1. Market growth and trends:
    - What is the expected growth of the solar energy-market till 2020?
    - What are the main trends in today's solar energy-market and which will be most influencing in the next 5 years?

2. New product developments
    - What were the main new products in 2012?
    - How competitive were the own new products in 2012?
3. General political and regulative environment and in particular the public support
    - How is the current public support situation in the EU?
    - What were the main changes in 2012?
    - What are the main changes expected in the next years?
    - What changes in the regulative environment within the EU had influence on the solar energy market in 2012?
4. Customer behavior and product awareness
    - How is the actual information level of the consumers concerning our product and the products of the competitors
    - What are the main reasons for a purchase decision of the customer?
5. Competitor strategies and product and service portfolio
    - What is the overall strategy of the competitor and how did recent market developments influence it?
    - What were the main developments in the product portfolio of the competitor?
    - What are the main advantage and disadvantages of the competitors' service offer compared with our service portfolio?

These are just some examples how the KITs and KIQs for companies in the field of solar energy may look like. Furthermore the geographical focus is of importance for the defining of the scope of a MI-program. Besides the own direct home market of a company it's also essential to monitor at least the most important countries in the own segment. The solar energy market overview showed that in the PV- and the solar thermal market Germany plays a major role and has a strong influence on the total European market and therefore should be part of the market monitoring. A similar role had Spain in the CSP-market and Italy and France are probably the countries to monitor in this segment in the near future. The geographical scope also depends on the MI-budget, because the research in several countries and therefore also in different languages is cost intensive and possibly needs external support. Since a MI-program is a living system a changed data situation could lead to an extension of the geographic scope. For example a recent article on an English news

portal could be reason enough to include Spain in the geographical focus of a company engaged in the PV- market:
“Mr Serrasolses, the secretary of an association promoting the use of solar energy, SEBA, is referring to the government's proposal for a tax solely on those who generate their own electricity. They would pay a backup toll for the power from their solar panels, in addition to the access toll paid by everyone who consumes electricity from the conventional grid. Although the tolls vary, if you pay an access toll of 0.053 euros per kWh, you could face a backup toll of 0.068 euros per kWh. The new tax would extend the average time it would take for solar panels to pay for themselves from eight to 25 years, according to the solar lobby…… Other countries are carefully watching developments in Spain. The governments in Latvia, the Czech Republic, Italy and Greece seem to be pondering similar cutbacks.” (Galanova, 2013)

A monitoring of Spain and its solar energy related political development could therefore deliver the crucial information for the decision makers within a company whether an engagement in the solar market in Spain and in the other States mentioned above is advisable.

3.2 WIND ENERGY

3.2.1 Market Status

The wind energy market in the European Union witnessed a steady growth since 2000 with a compound annual growth rate of over 11.6%.

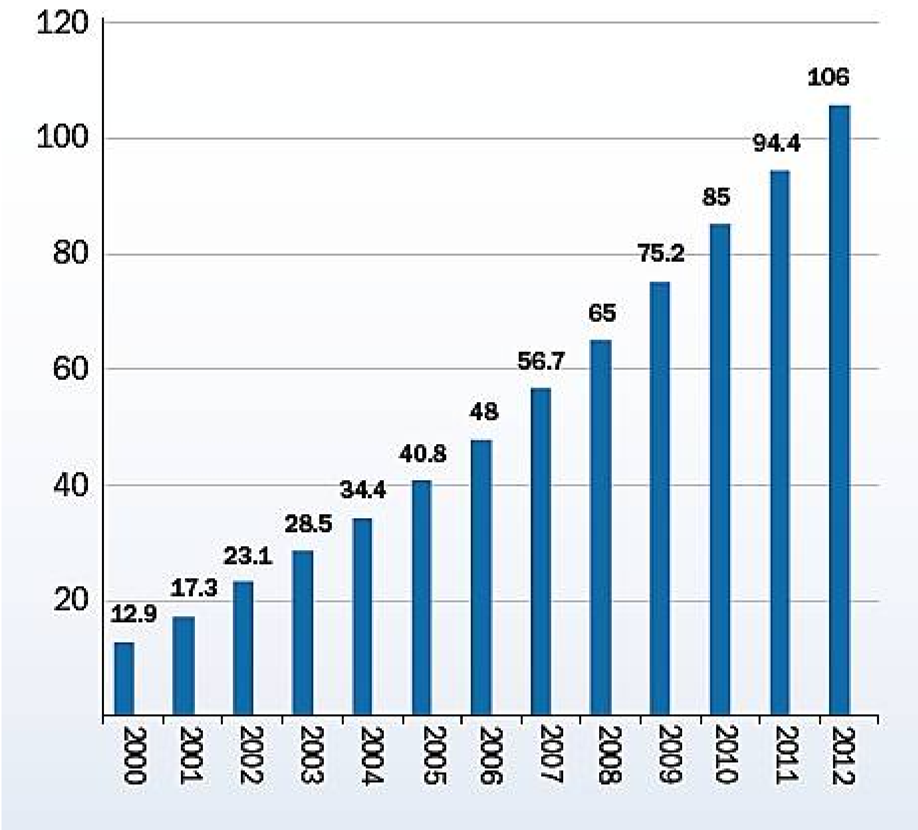


Figure 18: Cumulative wind Power installations in the EU (GW) (Source: Wind in power-2012 European statistics, EWEA, 2013).

The wind power market in 2012 seems to be unaffected by the economic crisis. 11,895 MW (10,729 MW onshore and 1,166 MW offshore) of wind power capacity were installed during this year. Germany was the main market in 2012 with an installation of 2,415 MW (80 MW or 3.3% offshore) followed by the United Kingdom with 1,897 MW (854 MW or 45% offshore), Italy with 1,273 MW, Spain (1,122 MW), Romania (923 MW), Poland (880 MW). Besides the record years in Romania and Poland the simple fact, that most of the in 2012 installed wind turbines were already permitted, financed and ordered before the crisis hit the wind industry. The crisis and its repercussions are expected to be witnessed by the wind market industry in 2013 and eventually also in 2014 (EWEA, 2013).

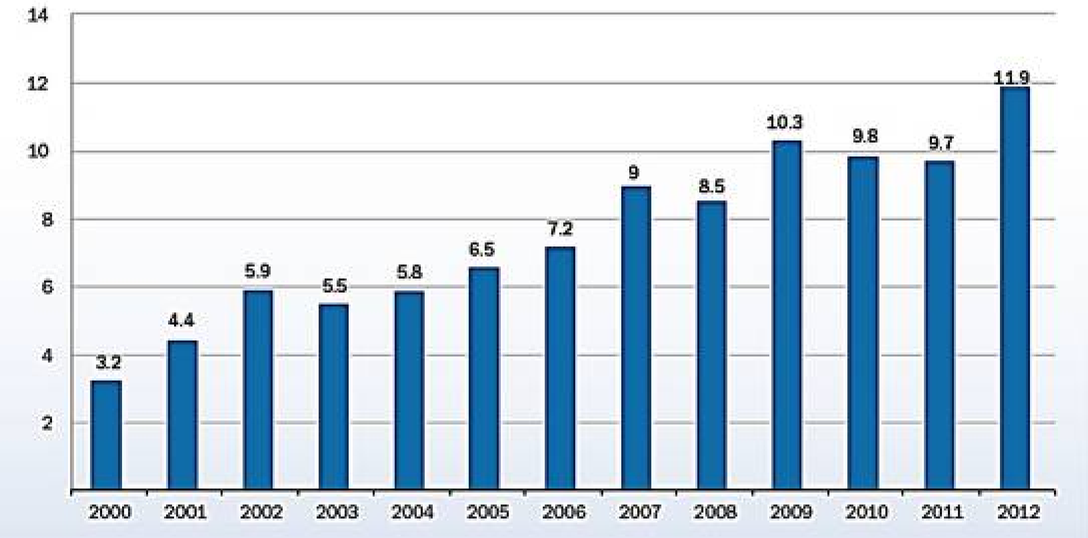


Figure 19: Annual Wind Power installations in the EU (GW) (Source: Wind in power-2012 European statistics, EWEA, 2013).

In some of the member states wind power has already a significant share in the total electricity consumption. The country with the highest share is Denmark with 27%, followed by Portugal with 17% and Spain with 16%. That's far beyond the gross electricity consumption share of wind energy in the EU with 7%.

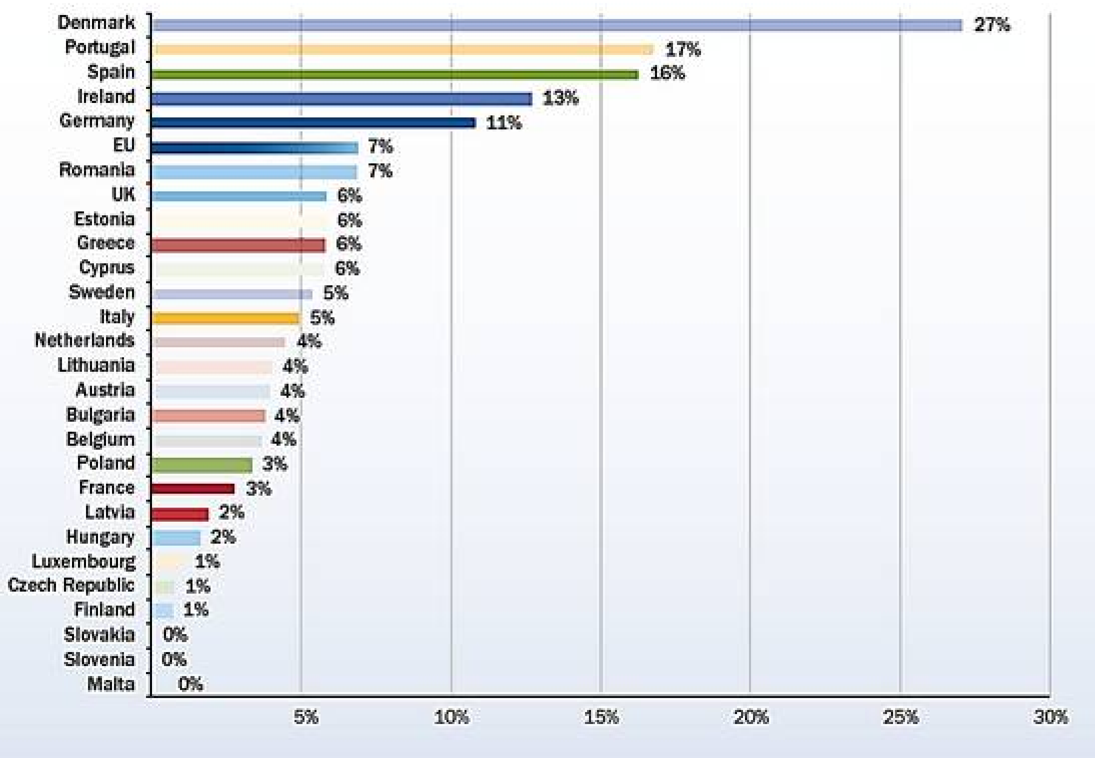


Figure 20: Wind Power shares of total electricity consumption in the EU-member states (Source: Wind in power-2012 European statistics, EWEA, 2013).

In view of the total installed capacity Germany dominates the wind power market in the EU with 31,307 MW considerably ahead of Spain with 22,796 MW and the United Kingdom with 8,445 MW. Concerning the offshore capacity is the UK with an installed capacity of 2,948 MW the clear market leader, followed by Denmark with 921 MW and Belgium with 380MW. In comparison to the National Renewable Energy Action Plans the onshore market is almost on track (-0.7%), but the offshore market is with -14, 3% little bit behind the target.

Table 8: Wind Power capacity targets, NREAP and real (MW) (Source: Wind in power-2012 European statistics, EWEA, 2013).

	Onshore 2012		Offshore 2012		Total 2012		Difference 2012			
	NREAP	Real	NREAP	Real	NREAP	Real	Onshore	Offshore	Total	
Austria	1,435	1,378	0	0	1,435	1,378	-57	0	-57	-4%
Belgium	720	996	503	380	1,223	1,375	276	-124	152	12.5%
Bulgaria	451	684	0	0	451	684	233	0	233	51.7%
Cyprus	114	147	0	0	114	147	33	0	33	28.9%
Czech Rep	343	260	0	0	343	260	-83	0	-83	-24.2%
Denmark	2,985	3,241	856	921	3,841	4,162	256	65	321	8.4%
Estonia	311	269	0	0	311	269	- 42	0	-42	-13.5%
Finland	380	262	0	26	380	288	-118	26	-92	-24.2%
France	7,598	7,564	667	0	8,265	7,564	-34	-667	-701	-8.5%
Germany	30,566	31,027	792	280	31,358	31,307	461	-512	-51	-0.2%
Greece	2,521	1,749	0	0	2,521	1,749	-772	0	-772	-30.6%
Hungary	445	329	0	0	445	329	-116	0	- 116	-26.1%
Ireland	2,334	1,713	36	25	2,370	1,738	-621	-11	-632	-26.7%
Italy	7,040	8,144	0	0	7,040	8,144	1,104	0	1,104	15.7%
Latvia	49	68	0	0	49	68	19	0	19	38.8%
Lithuania	250	225	0	0	250	225	-25	0	-25	-10%
Luxembourg	54	45	0	0	54	45	-9	0	-9	-16.7%
Malta	2	0	0	0	2	0	-2	0	-2	-100%
Netherlands	2,727	2,144	228	247	2,955	2,391	-583	19	-564	-19.1%
Poland	2,010	2,497	0	0	2,010	2,497	487	0	487	24.2%
Portugal	5,600	4,523	0	2	5,600	4,525	-1,077	2	- 1,075	-19.2%
Romania	1,850	1,905	0	0	1,850	1,905	55	0	55	3%
Slovakia	150	3	0	0	150	3	-147	0	-147	-98%
Slovenia	2	0	0	0	2	0	-2	0	- 2	-100%
Spain	23,555	22,796	0	0	23,555	22,796	-707	0	-707	-3.2%
Sweden	2,311	3,582	97	164	2,408	3,745	1,269	67	1,336	55.6%
UK	5,970	5,497	2,650	2,948	8,620	8,445	-473	298	- 175	-2%
EU-27	**101,773**	**101,048**	**5,829**	**4,993**	**107,602**	**106,041**	**-725**	**-836**	**-1,561**	**-1.5%**
EWEA 2009 EU		**98,000**		**5,300**		**103,300**				
Difference EWEA 2009 and real		**3,048**		**-307**		**2,741**				

3.2.2 Political environment

Compared with PV, the wind power is rather cost effective for the public supporter. The maximum support in 2011 was 95.38€/MWh granted by Slovenia, whereas Luxembourg as maximum supporter in the PV-field invested 543.43€/MWh. Austria gave the minimum support for wind power in 2011 with 21.55€/MWh.

Table 9: Weighted average support level for wind energy (on electricity supported) 2010-2011 (€/MWh) (Source: CEER: “Status Review of Renewable and Energy Efficiency Support Schemes in Europe”, CEER, Bruxelles, 2013).

Member state	2010	2011	Change
Austria	30.95	21.55	-10.76%
Belgium	94.88	94.58	-3.15%
Czech Republic	41.84	63.56	-0.80%
France	35.51	33.04	-3.79%
Germany	41.05	45.43	-8.79%
Italy	76.10	69.00	-9.73%
Luxembourg	28.32	36.38	+30,90%
Netherlands	81.16	68.47	-9.75%
Portugal	52.84	42.68	+0.23%
Romania	55.00	65.17	+43.16%
Slovenia	95.38	95.38	0%
Spain	45.55	40.94	-10.79%
UK	69.63	72.71	+45.45%
Minimum support	28.32	21.55	+43,16%
Maximum support	95.38	95.38	+9,49%

Despite the expected slowdown in 2013 and probably also in 2014 the prognosis whether the wind power market can achieve the 2020 target or not is still positive. Due to the expected hard time in the next two years the total installed capacity in 2015 is estimated to be just 138 GW, 4.9 GW lower than aspirated. For the following years a recovery from the economic crisis is expected and the total installed capacity in 2020 is predicted to be 220 GW. That’s a plus of 6.6 GW compared to the 2020 target of 213.4GW. Besides the shrinking influence of the economic crisis, a predicted ongoing decrease of the turbine prices shall contribute to this estimated growth. Furthermore the Regulation on the Guidelines for trans-European energy infrastructure (TEN-E Guidelines) is also expected to accelerate the needed investments in energy infrastructure. The TEN-E Guidelines provide a strategic framework for the energy infrastructure of the European Union and shall help to tackle the shortcomings in terms of problems with permitting procedures as well as financing. Especially for the highly volatile wind power an upgraded and modernized grid infrastructure is essential for its way to become a cost effective and reliable substitute of fossil energy (EurObserv’er, 2013).

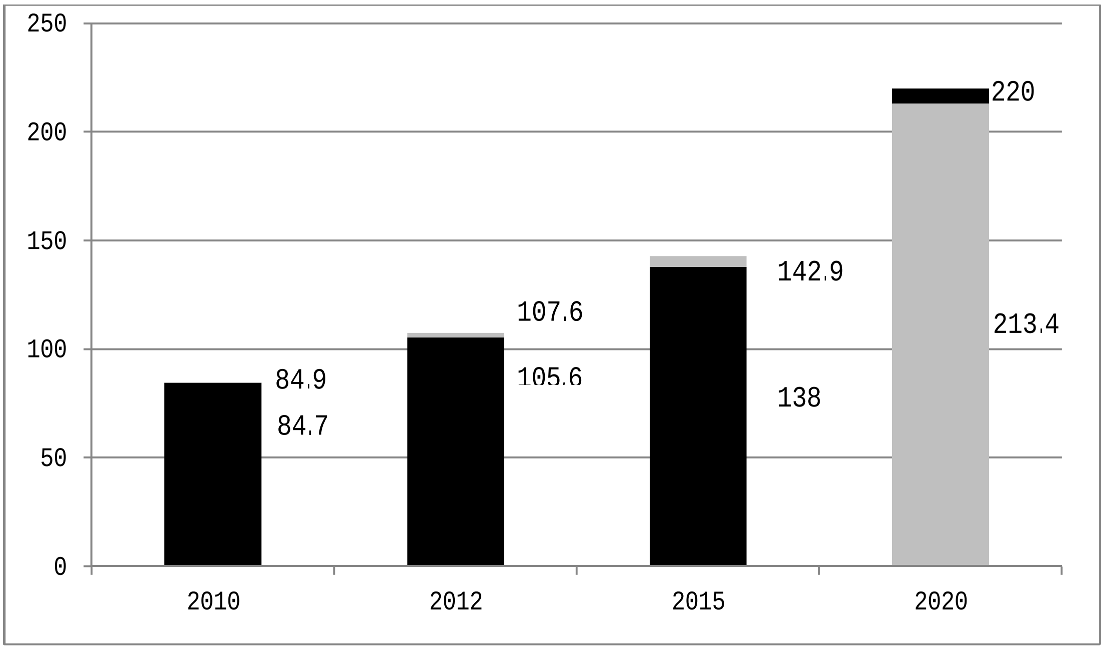


Figure 21: Comparison of the wind current trend against the NREAP roadmap in GW (Source: Wind Energy Barometer, EurObserv'er, 2013).

3.2.3 Trends

The main trends in the wind power market are the increasing importance of offshore wind parks, the rising wind service market, the shrinking price for wind turbines and the potential of small wind turbines.

Offshore wind parks:

According to the rather optimistic estimations of the European Wind Energy Association the offshore share of the wind energy market in the European Union will increase from 2% in the year 2008 to 17% in 2020 and 38% in 2030. In installed capacity this would mean a rise from 1.5 GW in 2008 to 40 GW in 2020 and 150 GW in 2030. In this scenario 33% of EU electricity consumption would derive from wind power (EWEA, 2013).

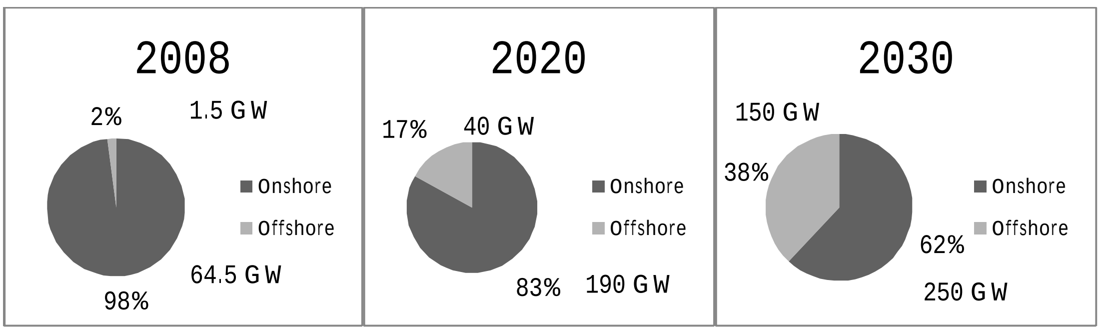


Figure 22: Development of the onshore/offshore shares of the wind energy market in the EU (Source: The European Wind Initiative-Wind Power Research and Development to 2020, EWEA, 2013).

Considering the relatively high costs of offshore wind parks and the slow optimization of the grid this estimations are rather ambitious, but there is undoubtedly a huge potential in the offshore wind-market and its share of the wind energy market in the EU will strongly increase in the next decades.

Wind service market:

According to a survey of Deloitte and Taylor Wessing the wind service market will increase 4.5 billion € in 2020 from 2.3 billion € in 2011. Main drivers of this increase are both aging wind parks and the rising installation of new ones.

Figure 23: Global and European wind service market (Source: European Wind Service Study, Deloitte and Taylor Wessing, 2012).

Furthermore the trend goes to much longer-term service and maintenance contracts- the average contract duration has raised from 4.5 years in 2008 to 6.9 years in 2012. For OEM-manufactures this trend offers an increasing possibility for stabilizing their business, because long-lasting service and maintenance contracts can compensate the expected volatile and highly competitive wind-turbine and wind park construction-market in the next years.

The growth of the wind service market leads also to a decrease of prices for full-service and maintenance contracts. From 2008 the average price for this contracts declined from 30,900 €/MW to 19,200 €/MW per year in 2012, which means 38% decrease since 2008 (BNEF, 2012).

Shrinking price for wind turbines:

According to the Bloomberg New Energy Finance Wind Turbine Price Index (WTPI) contracts signed in the second half of 2011 for 2013 delivery had an average price of 0.91million€/MW, a minus of 0.3 million€/MW or about 25% from the

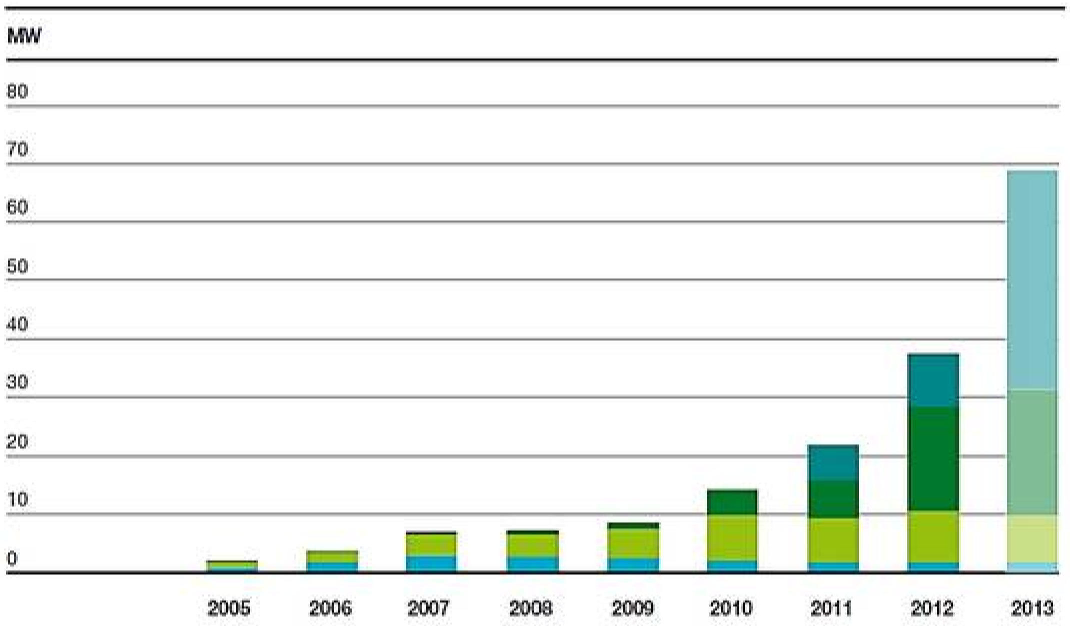
1.21million€/MW in 2009.This development should lead to a real competiveness without subsidies of new wind parks with coal-fired power plants in the year 2016. This would have also the consequence, that public authorities could slowly reduce the subsidies and focus more on the improvement of the regulative environment and to increase the end-customers' acceptance.

Small wind turbines:

The small wind market (< 100 kW) has a high potential and a steady growth over the last years. Globally at least 730'000 small wind turbines were installed at the end of 2011 – an 11 % growth compared to 2010. The market is dominated by two countries - China accounts for 40 % and the USA for 35 % of the total installed capacity of 576 MW in 2011. Of this capacity 120 MW was installed only in the year 2011, an increase of 27 % and almost the double of the new installed 64 MW in 2010. This trend is estimated to continue and shall lead to a cumulative installed capacity of 5 GW by 2020. In developing countries small wind installations could be a competitive substitute for fossil fuels for power generation, especially in areas without access to the national electricity grid. Also in the European Union small wind has a huge potential, for instance for the self-supply of energy in residential areas. The main hind for the further development of the small wind market is the relatively high price in the USA the average installed cost of all small wind turbines was 6,040$/kW in 2011, whereas in China the average costs were still 1,900$/kW. To unveil the total potential of the small wind market in the European Union a special feed-in tariff system should be installed in more Member States. Up to now, only in Denmark, Portugal, Italy, Cyprus, Greece, Slovenia and the United Kingdom feed-in tariffs are established (WWEA, 2013).

The UK is a good example for the potential in the small wind market. Since the start of the feed-in tariffs scheme in April 2010 the Installation of small and medium (=500kW) wind turbines witnessed a considerable growth from 14.24 MW to estimated 68.55 MW in 2013. The small wind market (< 100 kW) grew in the same time frame from 14.24 MW to 31.55 MW, a 122% rise. Despite this remarkable success new tariff levels for wind and other non-PV technologies together with a capacity-driven degression mechanism effective from 1 April 2014 came into force. This is expected to lead to 20% lower feed-in tariff for small and medium wind projects from 1 April 2014 on (RenewableUK, 2013).

This development could mean that the European Union runs the risk of missing this global trend and the possibility to directly involve the population with own installations in the wind energy market with all the associated positive effects on the acceptance in the population like in the PV-market. Keeping in mind the still existing reservations in the population concerning wind energy and their aesthetic impact on the countryside the direct involvement of the population seems even more important.



	2005	2006	2007	2008	2009	2010	2011	2012	2013
100–500kW	0	0	0	0	0	0	6.12	9.02	37.30
15–100kW	0.11	0.18	0.67	0.60	1.22	4.30	6.45	18.06	21.77
1.5–15kW	0.98	1.58	3.31	3.86	4.89	7.90	7.41	8.43	7.94
0–1.5kW	0.99	1.94	3.15	2.80	2.52	2.04	1.94	2.01	1.84

Figure 24: Annual deployed UK small and medium wind turbine capacity in MW (Source: Small and Medium Wind-UK Market Report, RenewableUK, 2013).

3.2.4 Market intelligence perspective

The market overview showed that the wind energy market in the EU is a constantly growing market with the trend towards off-shore wind parks and more cost-effective turbines. After the need analysis shown above on the example of the solar energy market, the secondary or desk research is the next step of the intelligence cycle. This secondary research shall deliver the basis information for a further analysis. Sources for the secondary research can be free available reports like the one used for the market overview, articles in newspapers and specialist magazines, and news on the websites of companies, public bodies or associations. For very important and not free available information there is also the possibility to buy reports from external experts.

Today the best possibility to get a lot of news about a certain market and continuously provide up-to-date information is to scan the internet via RSS-feeds. Within an RSS-feed reader you can establish search strings for certain key words (e.g. for the wind energy market this could be: wind turbine, wind park, wind power, and so on) and thereby scan the daily news for interesting information for the own company. Since this method delivers an information overload a dedicated analyst has to design and continuously update the search strings and filter the results. After extracting of the relevant information the analyst writes a short abstract. For example on 21 October 2013 a German news portal (Moritz, 2013) reported about potential changes of the environmental impact assessment that could have negative impacts on the European wind energy market. An analyst would recognize the important of this information, because auf the well-known influence of the political and regulative environment on the wind market. He would translate the German article into English and write a short abstract that could consist of for example a headline and three bullet points and a link to the original article:

The European Parliament has dismissed environment protection editions for building projects which could stop the new construction of wind turbines:

- European Parliament adopted amendments for the environmental impact assessment of the effects of certain public and private projects on the environment
- Visual impact shall be a key criterion in the environmental impact assessment
- In the justification of the application the fundamental importance of the optical effect for coasts, wind parks and historical buildings was mentioned.

Link to original article

If the information has such a potential importance for the company the analyst should verify the source of the article. In this case recheck the documentation of the European parliament and add the exact wording:

According to the amendments adopted by the European Parliament on 9 October 2013 on the proposal for a directive of the European Parliament and of the Council amending Directive 2011/92/EU of the assessment of the effects of certain public and private projects on the environment the *(11a) in terms of the preservation of* *historical and cultural heritage, of natural landscapes and of urban areas; this is another factor that should be applied in assessments.* (European Parliament, 2013)

Now the decision makers within the company have sufficient information either to ask for a deeper analysis of the potential impacts of this development on the company or directly take measurements to react on this development.
The importance of this information and the time period between the decision of the European parliament on 9 October 2013 and the release of the article on 21 October 2013 should motivate the analyst to direct scan the website of the European parliament for future relevant news. The direct monitoring of certain important websites is a deepening of the internet scanning based on experience. For the wind energy market such a selection of important websites could look like the following:

For political and regulative developments:
European parliament, the Energy website of the European commission

For market reports and technological developments:
European Wind Energy Association, International Energy Agency

For news:
Professional magazines like Windpower Monthly

Companies:
E.g. Vestas and Enercon

Ideally this information is stored and distributed via a MI-portal. Without such a portal the storage has to happen within the MI-team and the distribution via e-mail. Potential deliverables made out of the results of a secondary research are small reports like this wind energy market in the EU overview, news abstracts, briefings and rapid response researches.

3.3 BIOMASS

3.3.1 Market Status

Bioenergy plays an important role among the renewables in the European Union - almost 64% (118.22 Mtoe) of the total gross inland consumption of renewables (152 Mtoe) in the EU in 2010. This represented 8.16% of the total final energy consumption in EU (AEBIOM, 2012).

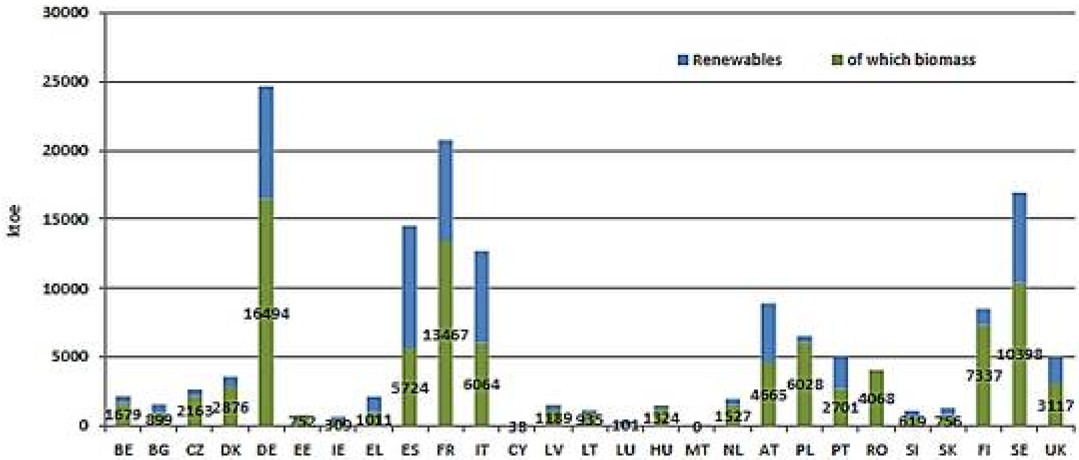


Figure 25: Gross inland consumption of RES in Europe (Source: European Bioenergy Outlook 2012, AEBIOM, 2012).

The main difference between the biomass market and the wind and solar market is that the energy source is not free. The main purchased sources in the EU are herbaceous & fruit biomass (24%), followed by forest residues (23%) and firewood (19%).

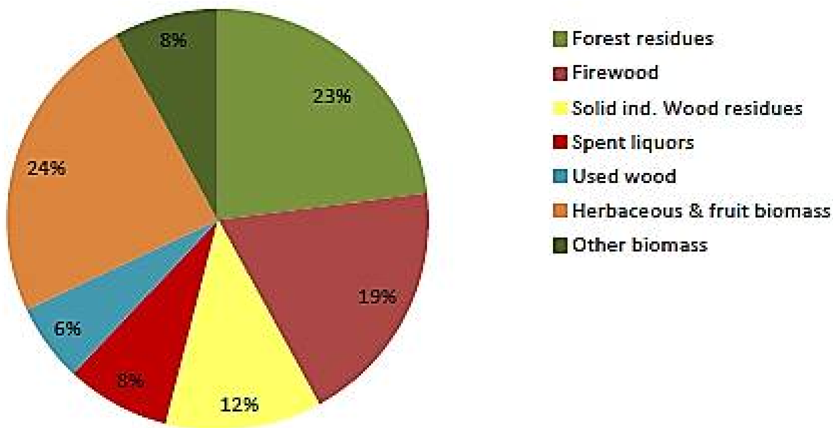


Figure 26: Biomass resources by different sources in EU 24 and Norway (Source: European Bioenergy Outlook 2012, AEBIOM, 2012).

For this market overview the focus will be on solid biomass and biogas.

3.3.2 Solid Biomass

The negative influence of the economic crisis on the solid biomass market in the European Union was rather low. Till 2010 it witnessed a stable growth up to 81.1 MToe primary energy production. The reduction in 2011 derives from the predominantly mild winter which lowered heating requirements and therefore the demand for solid biomass in many member states of the EU.

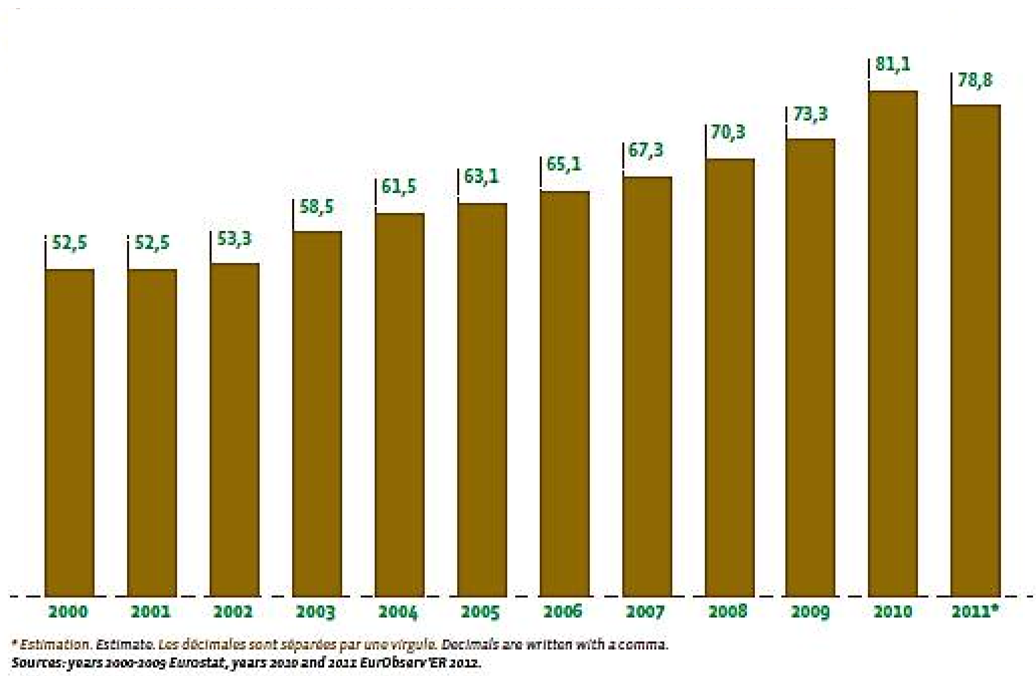


Figure 27: Solid biomass primary energy production growth since 2000 in MToe (Source: Solid Biomass Barometer, EurObserv'er, 2012).

The main driver of the solid biomass market in the recent years was the electricity production. The gross electricity production in the European Union increased in 2011 up to 72.8 TWh, a plus of 1.828 TWh or 2.6%. CHP plants provided with 42. 151 TWh most of this output, but the electricity only plants increased their share from 37 % in 2010 to 42.1% in 2011. Among the Memberstates of the European Union Germany with 11.539 TWh produced most electricity out of solid biomass, followed by Finland with 9.968TWh and Sweden with 9.641 TWh. The UK registered the most significant increase from 5,252 TWh to 6.1 TWh, or 16.9% between 2010 and 2011. Despite this positive result, there is still uncertainty concerning the future developments in the UK, because of the continuous changes in the public funding scheme.

Table 10: Gross electricity production from solid biomass in the EU 2010-2011 in TWh (Source: Solid Biomass Barometer, EurObserv'er, 2012).

	2010			2011		
Pays/Country	Centrales électriques seules/ *Electricity only plants*	Centrales en cogénération/ *CHP plants*	Electricité totale/ *Total electricity*	Centrales électriques seules/ *Electricity only plants*	Centrales en cogénération/ *CHP plants*	Electricité totale/ *Total electricity*
Germany	7,521	3,209	10,730	6,814	4,725	11,539
Finland	1,552	9,018	10,570	1,495	8,473	9,968
Sweden	0,000	10,260	10,260	0,000	9,641	9,641
Poland	0,000	5,906	5,906	4,496	2,605	7,101
United Kingdom	4,677	0,575	5,252	5,500	0,637	6,137
Netherlands	2,447	1,750	4,197	2,328	1,649	3,977
Austria	1,467	2,426	3,893	1,279	2,649	3,928
Denmark	0,000	3,314	3,314	0,000	3,064	3,064
Spain	1,342	1,166	2,508	1,572	1,365	2,937
Belgium	1,900	1,004	2,904	1,900	1,004	2,904
Italy	1,543	0,717	2,260	1,678	0,845	2,522
Portugal	0,665	1,560	2,225	0,745	1,722	2,467
France**	0,314	1,216	1,530	0,320	1,218	1,538
Hungary	1,900	0,134	2,034	1,446	0,076	1,522
Czech Republic	0,595	0,898	1,493	0,650	1,036	1,686
Estonia	0,255	0,475	0,730	0,255	0,475	0,730
Slovakia	0,000	0,682	0,682	0,000	0,614	0,614
Ireland	0,092	0,019	0,111	0,120	0,016	0,137
Slovenia	0,000	0,120	0,120	0,000	0,125	0,125
Lithuania	0,000	0,116	0,116	0,000	0,121	0,121
Romania	0,048	0,062	0,110	0,048	0,062	0,110
Bulgaria	0,000	0,019	0,019	0,000	0,019	0,019
Latvia	0,002	0,007	0,009	0,003	0,010	0,013
European Union	**26,320**	**44,652**	**70,972**	**30,649**	**42,151**	**72,800**

** Estimation. Estimate. ** DOM non inclus pour la France. Overseas departments not included for France. Les décimales sont séparées par une virgule. Decimals are written with a comma.* **Source: EurObserv'ER 2012.**

The heat production from solid biomass in the European Union witnessed a decrease from 7.523 MToe in 2010 to 6.956 MToe or -7.5% in 2011. Also in the field of heat production CHP plants delivered the bigger share during this year: 4.226 MToe or 60.75%.

Sweden was the market leader with a heat production of 2.047 MToe in 2011, a decrease of 0.568 MToe or 21.7% compared to 2010. On the second place was Finland with 1.5 MToe, quite stable with just a loss of 0.032 MToe or -2.1%. Also relatively steady Austria, with the third largest heat production from solid biomass in the European Union with 0.89 MToe and a moderate decrease of 0.044 MToe or 4.7%.

Table 11: Heat production from solid biomass in the EU 2010-2011 in MToe (Source: Solid Biomass Barometer, EurObserv'er, 2012).

Pays/Country	2010 Unités de chaleur seule/Heat plants only	2010 Unités fonctionnant en cogénération/CHP plants	2010 Chaleur totale/Total Heat	2011 Unités de chaleur seule/Heat plants only	2011 Unités fonctionnant en cogénération/CHP plants	2011 Chaleur totale/Total Heat
Sweden	0,836	1,779	2,615	0,760	1,287	2,047
Finland	0,492	1,041	1,532	0,500	1,000	1,500
Austria	0,514	0,420	0,934	0,459	0,431	0,890
Denmark	0,395	0,491	0,886	0,363	0,481	0,844
Germany	0,148	0,231	0,379	0,149	0,296	0,444
Poland	0,038	0,236	0,274	0,040	0,292	0,332
Lithuania	0,149	0,036	0,186	0,152	0,036	0,188
Italy	0,053	0,094	0,147	0,064	0,114	0,178
Estonia	0,065	0,076	0,141	0,058	0,068	0,126
Latvia	0,092	0,010	0,101	0,081	0,010	0,091
Slovakia	0,044	0,057	0,101	0,038	0,050	0,088
Czech Republic	0,022	0,037	0,059	0,024	0,038	0,062
Hungary	0,004	0,052	0,056	0,004	0,052	0,056
Netherlands	0,000	0,049	0,049	0,000	0,046	0,046
Romania	0,030	0,005	0,035	0,030	0,005	0,035
Slovenia	0,005	0,013	0,018	0,006	0,013	0,019
Belgium	0,000	0,007	0,007	0,000	0,007	0,007
Luxembourg	0,002	0,000	0,002	0,002	0,000	0,002
Bulgaria	0,001	0,000	0,001	0,001	0,000	0,001
European Union	2,889	4,634	7,523	2,730	4,226	6,956

* Estimation. Estimate. ** Chaleur vendue dans les réseaux de chaleur. Heat sold in district heating. Source: EurObserv'ER 2012.

3.3.3 Biogas

Both the heat and the electricity production from biogas increased from 2010 to 2011, so far unimpressed by the economic crisis. The electricity production grew from 30.33 TWh by 18.2% to 35.9 TWh. Unlike the situation in the solid biomass market the greater share in 2011 came from electricity only plants with 21.3 TWh or 59.4% a reduction of 21.4% compared to 2010. Germany is by far the biggest producer in the European Union with 19.42 TWh in 2011, an increase of 3.22 TWH or + 19.9% to 2010, followed by the United Kingdom with 5.73 TWh. This meant a small increase of 0.023 TWh or 0.4% in the United Kingdom. Among the big producers Italy had the largest growth from 2.05 TWh in 2010 to 3.4 TWh 2011 or +65.7%. These three largest producers contribute 28.55 TWh or almost 80% of the total electricity production from biogas in the European Union.

Table 12: Gross electricity from biogas in the EU 2010-2011 in GWh (Source: Biogas Barometer, EurObserv'er, 2012).

Pays/Country	2010 Centrales électriques seules/ Electricity only plants	2010 Centrales fonctionnant en cogénération/ CHP plants	2010 Total/ Total	2011* Centrales électriques seules/ Electricity only plants	2011* Centrales fonctionnant en cogénération/ CHP plants	2011* Total/ Total
Germany	14 847,0	1 358,0	16 205,0	10 935,0	8 491,0	19 426,0
United Kingdom	5 137,0	575,0	5 712,0	5 098,0	637,0	5 735,0
Italy	1 451,2	602,9	2 054,1	1 868,5	1 536,2	3 404,7
France	756,0	297,0	1 053,0	780,0	337,0	1 117,0
Netherlands	82,0	946,0	1 028,0	69,0	958,0	1 027,0
Spain	536,0	117,0	653,0	709,0	166,0	875,0
Czech Republic	361,0	275,0	636,0	535,0	394,0	929,0
Austria	603,0	45,0	648,0	555,0	70,0	625,0
Belgium	149,0	417,0	566,0	158,0	442,0	600,0
Poland	0,0	398,4	398,4	0,0	430,0	430,0
Denmark	1,0	352,0	353,0	1,0	342,0	343,0
Ireland	184,0	22,0	206,0	181,0	22,0	203,0
Greece	190,5	31,4	221,9	37,6	161,7	199,3
Hungary	75,0	21,0	96,0	128,0	55,0	183,0
Portugal	90,0	11,0	101,0	149,0	11,0	160,0
Slovenia	7,2	90,2	97,4	5,7	121,0	126,7
Slovakia	1,0	21,0	22,0	39,0	74,0	113,0
Latvia	5,9	50,8	56,7	0,0	105,3	105,3
Finland	51,5	37,8	89,2	53,6	39,4	93,0
Luxembourg	0,0	55,9	55,9	0,0	55,3	55,3
Lithuania	0,0	31,0	31,0	0,0	37,0	37,0
Sweden	0,0	36,4	36,4	0,0	33,0	33,0
Romania	0,0	1,0	1,0	0,0	19,1	19,1
Estonia	0,0	10,2	10,2	0,0	17,0	17,0
European Union	24 528,2	5 803,0	30 331,2	21 302,4	14 554,1	35 856,4

* Estimation. Estimate. Les décimales sont séparées par une virgule. Decimals are written with a comma. Source: EurObserv'ER 2012.

The gross heat production from biogas in the European Union improved from 173.8 ktoe in 2010 to 201.6 ktoe in 2011, an increase of 16%. CHP plants contributed the bigger share with 146.4 ktoe or 72.6% in 2011, an increase of 16.6 ktoe compared to 2010. Like in the electricity market Germany is not only by far the biggest producer in the European Union with 58 ktoe in 2011, but also witnessed the biggest growth with 22 ktoe or 63.5% from 2010. In the heat production market in the European Union Italy is on second place with exclusively by CHP plants produced 29.7 ktoe, up by 5.1 ktoe or 20.7 % compared to 2010, followed by Denmark with 28.9 ktoe. This represents a moderate increase of 1.3 ktoe or 4.7% from 2010 to 2011. With a share of 57.8 % the gross heat production from biogas is dominated by these three countries. The following next three countries Poland, Sweden and Austria contribute together 40.1 ktoe or 19.9%. Therefore the six biggest producers stand for more than three quarter (77.7%) of total gross heat production from biogas market in the European Union.

Table 13: Gross heat production from biogas in the EU 2010-2011 in ktoe (Source: Biogas Barometer, EurObserv'er, 2012).

	2010			2011		
Pays/Country	Unités de chaleur seules/ Heat only plants	Unités fonctionnant en cogénération/ CHP plants	Total/ Total	Unités de chaleur seules/ Heat only plants	Unités fonctionnant en cogénération/ CHP plants	Total/ Total
Germany	13,6	22,4	36,0	28,8	29,2	58,0
Italy	0,2	24,3	24,6	0,0	29,7	29,7
Denmark	3,5	24,1	27,6	3,9	25,0	28,9
Poland	0,3	17,6	18,0	0,0	14,9	14,9
Sweden	9,5	8,0	17,5	7,5	7,3	14,8
Austria	7,5	4,8	12,2	5,1	5,3	10,4
Finland	7,4	0,9	8,4	7,6	1,0	8,6
Belgium	0,0	6,5	6,5	0,0	6,9	6,9
Czech Republic	1,2	4,9	6,1	1,7	5,5	7,2
Netherlands	0,0	6,7	6,7	0,0	6,0	6,0
Slovenia	0,0	4,6	4,6	0,0	5,5	5,5
Latvia	0,0	1,2	1,2	0,0	4,0	4,0
Slovakia	0,7	1,0	1,7	0,4	3,3	3,7
Estonia	0,1	1,5	1,5	0,1	1,3	1,4
Luxembourg	0,0	0,8	0,8	0,0	0,9	0,9
Lithuania	0,0	0,4	0,4	0,0	0,6	0,6
European Union (27 countries)	44,1	129,8	173,8	55,1	146,4	201,6

* Estimation. Estimate. ** Chaleur vendue aux réseaux de chaleur ou aux usines. Heat sold to the district heating network or to the industrial units. Les décimales sont séparées par une virgule. Decimals are written with a comma. Source: EurObserv'ER 2012.

3.3.4 Political environment

In both areas solid biomass and biogas the European Union is on course to achieve its NREAP targets. Concerning heat consumption from solid biomass the exceptional decrease in 2011, explained by the mild winter, didn't hinder the positive long-term development. In 2015 the heat consumption from solid biomass is expected to be 75 MToe and therefore 8.8 MToe above the 66.2 MToe target. For 2020 it's estimated, that the real heat consumption from solid biomass will surpass the set target by 4 MToe and reach 85 MToe.

According to the prognosis of EurObserv'er the electricity production from solid biomass will exceed the target of 113.8 TWh in 2015 by 2.2 TWh and reach 116 TWh. Till 2020 the growth trend will slow down and will just achieve the 2020 target with expected 155 TWh to 154.9TWh.

Up to now the economic crisis didn't really affect the solid biomass. For the coming years it's expected that the negative aspects will become visible since the member states are a little less willing to safeguard renewable energy investments over the long term and consequently several planed plants are set on hold.

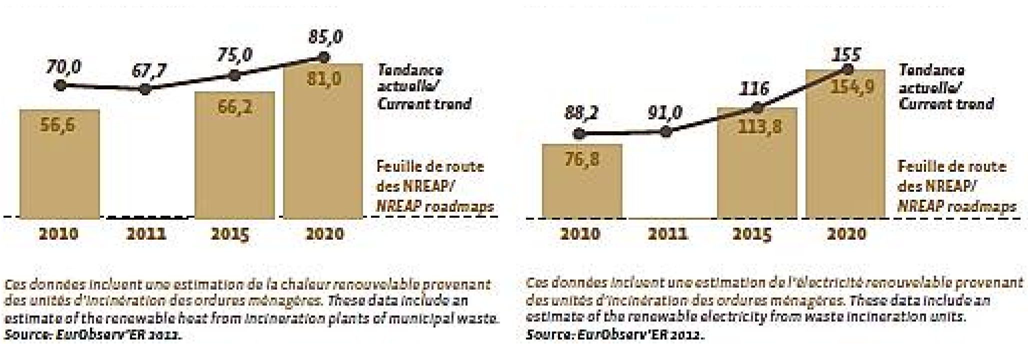


Figure 28: Comparison of the heat consumption and electricity production from solid biomass against the NREAP in MToe/TWh (Source: Solid Biomass Barometer, EurObserv'er, 2012).

Despite a potential growth slowdown the heat consumption from biogas in 2015 is expected to exceed the 2689 ktoe target in 2015 and reach 2700 ktoe. Also the 2020 target is predicted to be met by consuming 4500 ktoe, 24 ktoe more than according to the NREAP roadmap.

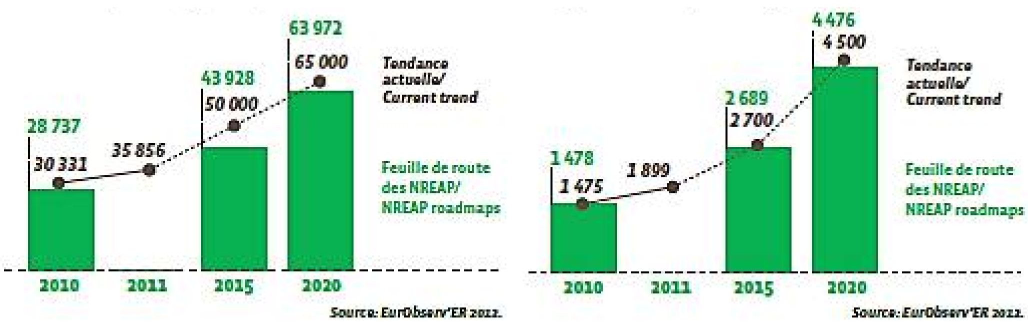


Figure 29: Comparison of the heat consumption and electricity production from biogas against the NREAP in ktoe/GWh (Source: Biogas Barometer, EurObserv'er, 2012).

Besides the insecurity factor of the volatile public subsidy scheme in the EU the European regulation bears another threat for the biomass market. On 11 September 2013 the European Parliament called for a cap on the use of traditional biofuels and an immediate switchover to new biofuels from alternative sources like algae. The new legislation states, that first-generation biofuels should not exceed 6% of the final energy consumption in transport by 2020, as opposed to the current 10% target in existing legislation (European Parliament, 2013). This decision could easily lead to similar changes for the solid biomass and biogas sector and cause a transformation phase with negative consequences on the established market players.

3.3.5 Trends

Besides the trend towards new sources of biomass like algae there are mainly trends to make the costs for biomass energy production competitive.
Technological improvements and economies of scale are expected to reduce the costs in the combustion step by 10-20% in 2020.
For the Co-firing and conversion segment higher fuel quality shall reduce the need for retrofits. Together with the increased operational experience and homogeneity this shall lead to 10% cost reduction. For condensing and CHP plants the economies of scale is expected to lead to a cost reduction of 20%. For example through the doubling of the capacity capital costs will decrease with 10% and operational cost with 15%.

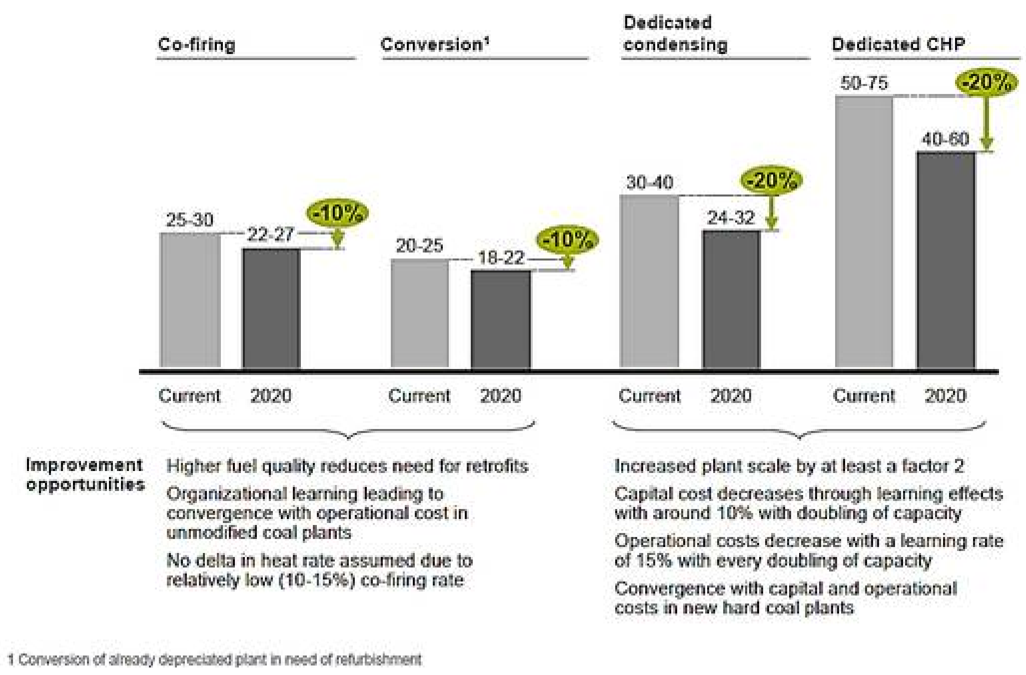


Figure 30: Cost reduction potential of 10-20% in combustion step in €/MWhel (Source: Biomass for heat and power-Opportunities and economics, European Climate Foundation et al., 2010).

Also feedstock costs are expected to be reduced through increased scale, better technology, and improved harvesting and gathering techniques. Since this segment represents 40-50% of the total production costs for power or heat the potential cost reduction of up to 25% would be very important for the compatibility of biomass.

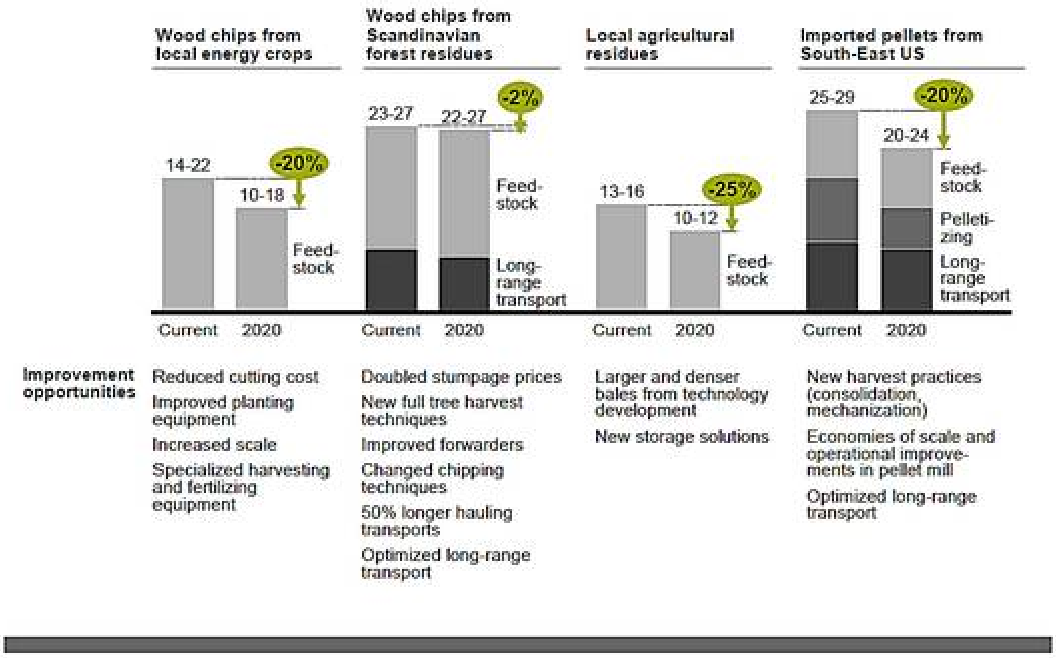


Figure 31: Cost reduction potential of up to 20% for biomass fuel delivered to power and heat plants in continental Europe in €/MWhel primary (Source: Biomass for heat and power-Opportunities and economics, European Climate Foundation et al., 2010).

Significant cost reductions (-20%) are predicted in the energy crop cultivation till 2020, mainly in the establishment and harvest phases. New harvesting methods and chipping techniques together with the optimization of the long range transport shall cut the costs woodchips from Scandinavia by 2%. Transportation and storage costs for local agricultural residues are expected to decline by 25% through larger and denser bales and new storage solutions. Also the costs for the more and more important pellets imports from the United States are estimated to decrease by 20%.

3.3.6 Market intelligence perspective

The market overview showed that the biomass market plays an important role among the renewables in the European Union and is expected to reach its parts of the 2020 targets. The main trends affect the cost reduction via technological improvements along the whole value chain. One of the main characteristics of the biomass market is that in contrary to the other renewables the energy source is not free. Biomass resources are a good example for the next step in the MI-circle – the primary research. Since these resources originate from the agriculture and forestry business it makes sense not only to purchase from them, but also try to profit from their expertise. The establishment of an external network in these segments is absolutely necessary for a company in the biomass sector- especially if the own company doesn't have its roots in one of these segments. Single interviews with experts or the visit of an agricultural and forestry fair would be a good start to establish a network. In case a network is already established and/or you need a lot of experts, even from different countries an online survey is a very good and cost effective way to get the needed information. For example the online survey of Dresden University of Technology concerning the SRC (Short Rotation Coppice) plantations in Germany needed just a handful, simple questions to get the opinions of 1031 agriculture or forestry experts concerning energy concepts, socioeconomics, business networks and landscape within only 35 days.

Table 14: Questionnaire of an online survey (Source: Neubert et al.: "Constraints on & recommendations for the expansion of SRC plantations in Germany ", 2013).

Why are you not interested in planting SRC? (1=unimportant to 5=very Important)	• **Lack of incentives** • **Lack of knowledge** • **High investment** • **Lack of market opportunities** • **Low profitability** • **Land availability**
How important are the following criteria in relation to cultivating SRC? (1=unimportant to 5=very Important)	• **Security of food supply** • **Own use of BM** • **Local added value** • **Land availability** • **Income diversification** • **Income contribution** • **Short planning & approval** • **Incentives**
Which network would you prefer in the SRC value chain?	• **Partnership (e.g. GbR)** • **Corporation (e.g. GmbH)** • **Cooperative** • **Community of interests** • **Producer group** • **Loose network**
How do you assess the visual impacts on the landscape? (1=negative to 5 positive) **Multiple responses possible**	• **Sugar beet** • **SRC** • **Potato** • **Spring grain** • **Rape**

	• Winter grain • Sunflower • Grassland
What importance do the following criteria have in your concepts? (1=unimportant to 5=very Important)	• Regional added value • SRC • Business networks • Use of wood for energy
What would you expect from participation in a regional planning process? **Multiple responses possible**	• Acceptance and expansion of SRC • Realization of project ideas • Obtain information on local developments • Reshape regional development • Other

This broad panel of participants ensures representative results and therefore a solid base for a potential deeper analysis as decision support for the management.

3.4 SMALL HYDRO ENERGY

3.4.1 Market Status

Small hydropower (installed capacity of up to 10 MW) adds about 8% of the total renewable electricity production in the European Union. The 21,800 SHP plants operating in the EU produced 51.3 TWh in 2010. Despite the fact that the installed capacity increased from 13.27 GW in 2010 to 13.61 GW in 2011 the electricity production decreased due to the relatively low rainfall during 2011 from 51.3 TWh in 2010 to 43.6 TWh in 2011.
Till 2020 the electricity generation is expected to increase to 59.7 TWh, with at that time 24,000 SHP plants in operation.

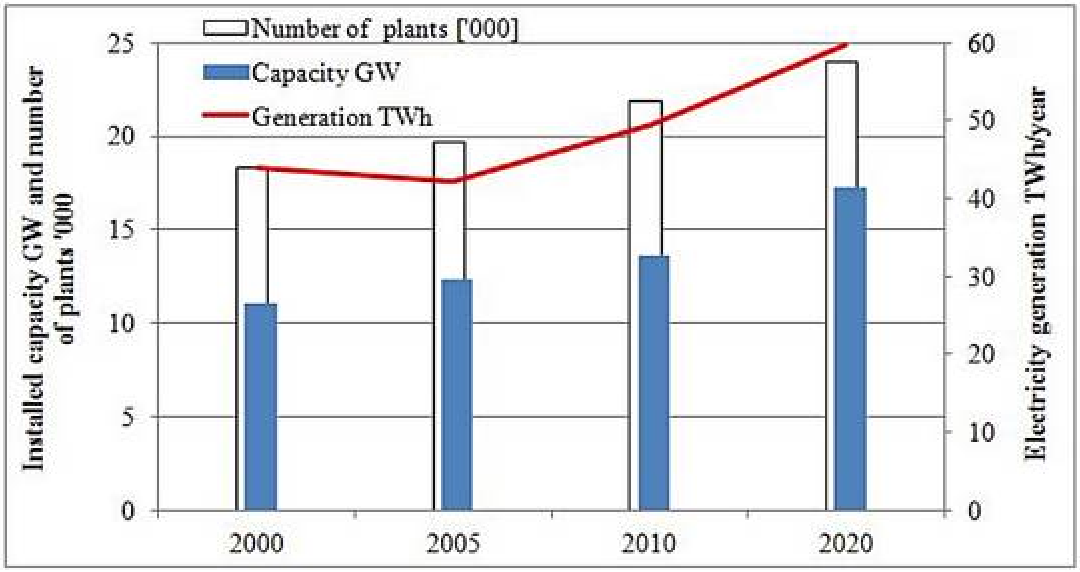


Figure 32: Number of SHP plants, their installed capacity and electricity generation between 2000 and 2020 in the EU (Source: Small Hydropower Roadmap-Condensed research data for EU-27, ESHA, 2012).

Italy is the main producer of SHP gross electricity in the European Union with 10.047 TWh in 2011, a decrease of 0.91 TWH or 8.3% compared to 2010. Spain is second with 6.433 TWh, a loss of 2.4 TWh or 17.2% from 2010, followed by Germany with 5.871 TWh, a decrease of 1.174 TWh or 15.4% compared with 2010. These top three producers represent 51.2% of the total SHP gross electricity production in the European Union.

Table 15: SHP gross electricity production in the EU in GWh (Source: The State of Renewable Energies in Europe, EurObserv'er, 2012).

	2010	2011*
Italy	10 957	10 047
Spain	8 833	6 433
Germany	6 945	5 871
France	7 055	4 752
Austria	4 986	4 697
Sweden	3 798	3 615
Finland	949	1 147
United Kingdom	702	1 049
Poland	1 036	943
Portugal	1 204	938
Czech Republic	1 159	895
Bulgaria	1 084	840
Romania	719	719
Greece	754	581
Slovakia	104	329
Slovenia	389	292
Belgium	185	123
Lithuania	93	90
Ireland	93	83
Latvia	76	64
Luxembourg	108	58
Hungary	67	51
Estonia	27	30
Denmark	21	17
Total EU	**51 344**	**43 665**

* *Estimation. Estimate. Source: EurObserv'ER 2012*

3.4.2 Political environment

The environmental requirements for SHP are rather restrictive in many Member States, especially the Environmental Impact Assessments (EIA) and the Water Framework Directive (WFD) mainly ignoring the environmental benefits of SHPs. These restrictive administrative and environmental requirements are based mainly on the assumption that hydropower would be a threat for the water ecology and caused lower production hours and consequently a cut in the profitability of SHPs (ESHA, 2012).

This affects also the future development of the SHP market and the probability to achieve the NREAP targets. Despite the installed capacity in 2010 surpass the set target by 474 MW the achievement of the 2020 targets is questionable. According to a prognosis of the EurObserv'er the installed capacity will reach 14 GW in 2015 and therefore barely miss the 14.39 GW target. In 2020 the gap will increase to 0.917 GW.

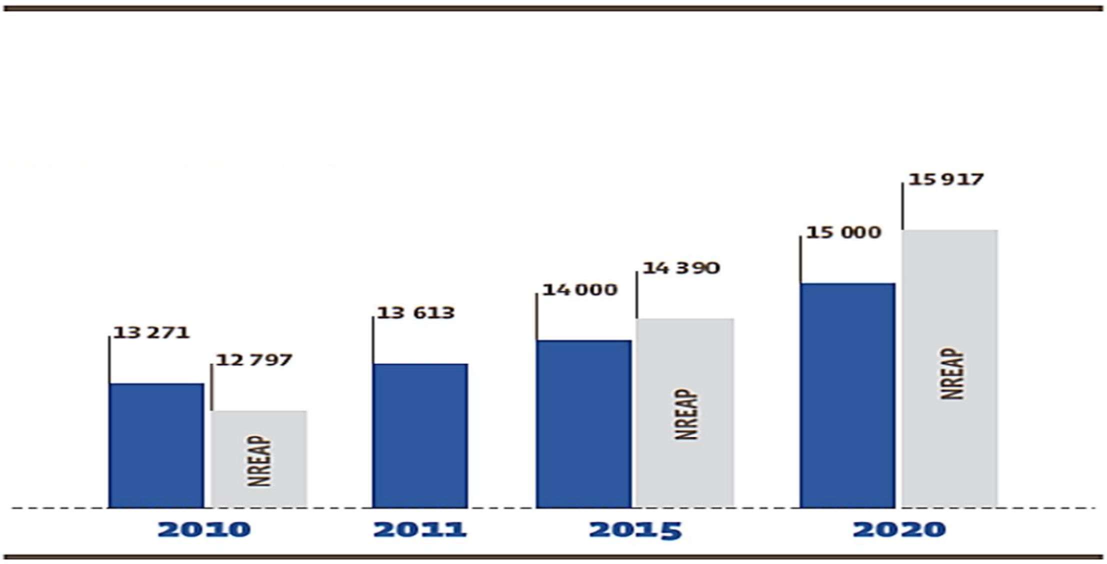


Figure 33: Comparison of the current trend of small hydraulic capacity installed against the NREAP roadmap in MW (Source: The State of Renewable Energies in Europe, EurObserv'er, 2012).

The main types of public funding in the Member States of the European Union for small hydropower are investment aids, tax exemptions/deductions, green certificates and FITs. In some countries a mixture of several funding types is installed.

Table 16: Resume of the support schemes for SHP in the EU (Source: Small Hydropower Roadmap-Condensed research data for EU-27, ESHA, 2012).

	AT	BE	BG	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	UK
FIT	x*		x	x	x		x	x		x	x	x	x	x	x	x	x			x				x	x
Premium (FIP)				x		x	x	x										x					X		
Quota Obligation/ Green Certificates		x												x	x				x		x	x			x
Investment Grants		x		x					x		x					x			x					x	
Tax Exemptions/ Deductions		x									x							x							
Fiscal Incentives					x													x							
Tendering		x								x															

**Existing plants will continue having a FIT for another several years. But since ~ 2010, small plants will receive an investment support of up to 30%.*

3.4.3 Trends

The main trends in the SHP market are technological developments that can avoid the negative influence of the environmental requirements on the profitability of SHP projects.
For example a water vortex power plant. The water vortex power plant of the Genossenschaft Wasserwirbelkraftwerke in Switzerland has a rotation pool in which the water is led. "*It is permeable, so small flotsam and fish can pass safely through the system, both upstream and downstream"* (Ziegler, 2011). The flowing water creates a vortex that is slowly turning a rotor, which drives the generator, through gravity and altitude difference. This system works for a fall height of 0.7 m and an average amount of water of 1,000 liters per second. Because of its simple technical equipment the maintenance and service costs are relatively low (GWWK, 2013).

A further possibility to cope with the environmental requirements is the electrical buoy designed by the Austrian company Aqua Libre This mobile hydro power plant floats free in the river, tied by chains. The Strom-Boje 3® is conceived for big rivers as for example the Danube, the Rhine or Inn. With the 250-cm rotor it delivers 70 kW nominal power with a current of 3.3 m/s. Depending on the location quality the system can deliver up to 300 MWh per year without disturbing the flora and fauna of the river or the shipping traffic (Aqua Libre, 2013).

3.4.4 Market intelligence perspective

The market overview showed that the small hydropower adds about 8% of the total renewable electricity production in the European Union, but the future development is threatened by rather restrictive environmental requirements for SHP. The main trends in this market are products that fit better to the environmental requirements. Consequently these products are rather new and their impact on the small hydropower is not proven yet and therefore a closer analysis is essential to identify the potential risks and chances of these products. A short SWOT-analysis (Strengths, Weaknesses, Opportunities, and Threats) can deliver the base for the decision how to react on this new product development. The Strom-Boje 3® designed by the Austrian company Aqua Libre is a good example for this next step in the MI-cycle:

Strengths:

The Strom-Boje 3® does not intervene in the ecology of the waters; it harms no swimmers, fishes, birds, or ships. No structural measurements such as concrete dams, sluices or fish ascent assistances are needed. Therefore this product is ideally suited for the restrictive environmental requirements. A further strength is the price of 3,300€ per KW, at 3.500 full load hours.

Weaknesses:

This product has not the same technical potential as traditional hydro power. The total techno-economic potential for hydropower in Austria amounts to 56 TWh to 58 TWh (Pöyry, 2008) -for the Strom-Boje 3® it is just 2 TWh.

Opportunities:

As a niche product it can be used everywhere, where no traditional SHP plant can or should be installed. The potential electricity production with electrical buoys in such areas just in Austria is expected to be 2 TWh. It is also an opportunity for potential autoproducers of electricity like small communities and enterprises.

Threats:

Making the leap to industrial-scale mass production could be very difficult for a small company like Aqua Libre. The future engagement of potent investors and business partners will make the difference between global success and failure.

Based on this short analysis the decision makers within a company in the SHP-market can decide whether such a niche product is of interest for the future development of the own company. If yes, at least a monitoring of the future development of this product on its intended way towards mass production is advisable.

3.5 GEOTHERMAL ENERGY AND GROUND SOURCE HEAT PUMPS

3.5.1 Geothermal Energy market status

The geothermal energy market in the European Union witnessed no major changes from 2010 to 2011. The installed capacity for heat production from geothermal energy in the EU in 2011 stayed with 2,337 MWth rather stable in comparison with 2,320.9 MWth in 2010. Also the energy recovery didn't change much from 594.9 ktoe in 2010 to 584.2 ktoe in 2011.

Table 17: Direct use of geothermal energy (except geothermal heat pumps) in 2010 and 2011 in the European Union countries (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012).

	2010		2011*	
	Puissance Capacity (MWth)	Énergie prélevée (ktep) Energy using (ktoe)	Puissance Capacity (MWth)	Énergie prélevée (ktep) Energy using (ktoe)
Italy	418,0	139,3	418,0	139,3
Hungary	654,0	101,0	654,0	101,0
France	345,0	91,0	391,0	83,3
Slovakia	130,6	76,0	130,6	76,0
Romania	153,2	32,1	153,2	32,1
Germany	115,6	24,5	120,5	26,4
Bulgaria	77,7	25,9	77,7	26,3
Austria	97,0	20,5	97,0	19,2
Slovenia	66,8	18,5	66,8	18,5
Greece	84,6	16,0	91,1	15,9
Poland	66,3	10,1	66,3	10,3
Portugal	27,8	10,3	27,8	10,3
Denmark	21,0	10,2	21,0	7,9
Netherlands	16,0	7,6	16,0	7,5
Belgium	3,9	4,3	3,9	3,9
Czech Republic	4,5	2,1	4,5	2,1
Spain	20,6	1,6	20,6	1,6
Lithuania	13,6	2,3	13,6	1,6
United Kingdom	2,0	0,8	2,0	0,8
Ireland	1,5	0,2	1,5	0,2
Latvia	1,3	0,7	0,0	0,0
Total EU	2 320,9	594,9	2 377,0	584,2

* Estimation. Estimate. Source: EurObserv'ER 2012

Italy stayed the biggest producer of geothermal heat with 418 MWth capacity and 139.3 ktoe energy in the European Union, followed by Hungary with 654 MWth and 101 ktoe - both without any changes from 2010 to 2011.

The installed capacity of geothermal power electricity plants in the European Union stayed as well rather stable – 937.2 MWe to 937.6 MWe in 2011. The net capacity (*The net capacity is the maximum power assumed to be solely active power that can be supplied with all plants running, at the point of outlet to the network, EurObserv'er, 2012)* just decreased by 1 MWe from 2010 to 2011. Italy dominated the geothermal power electricity market with 882.5 MWe installed capacity and 728.1 net capacity.

Table 18: Capacity installed and capacity useable of geothermal power electricity plants in the EU 2010-2011 in MWe (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012)

	2010		2011*	
	Puissance installée *Capacity installed*	Puissance nette *Net capacity*	Puissance installée *Capacity installed*	Puissance nette *Net capacity*
Italy	882,5	728,1	882,5	728,1
Portugal	29,0	25,0	29,0	25,0
France**	17,2	17,2	17,2	17,2
Germany	7,5	6,0	7,1	5,0
Austria	1,4	0,7	1,4	0,7
Total EU	937,6	777,0	937,2	776,0

* Estimation. *Estimate.* ** DOM inclus. *Overseas departments included.*
Note : La puissance nette est la puissance maximale présumée exploitable qui peut être fournie en régime continu au point de raccordement au réseau, lorsque la totalité de l'installation fonctionne. *The net capacity is the maximum power assumed to be solely active power that can be supplied, continuously, with all plant running, at the point of outlet to the network.* Source: EurObserv'ER 2012

The gross electricity production from geothermal energy in the European Union increased by 322.8 GWh or 5.75% from 5, 617.1 GWh in 2010 to 5,939.9 GWh in 2011. Italy, as biggest producer alone contributed 95.18% or 5,654 GWh in 2011 – a growth of 278.1 GWh or 5.17% from 2010. Portugal followed with 210 GWh in 2011, an increase of 12.9 GWh or 6.5% from 2010. The third largest producer was France with the biggest increase in proportional terms of 273.3% or 41 GWh from 15 GWh in 2010 to GWh 56 in 2011.

Table 19: Gross electricity production from geothermal energy in the EU 2010-2011 in GWh (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012).

	2010	2011*
Italy	5 375,9	5 654,0
Portugal	197,1	210,0
France**	15,0	56,0
Germany	27,7	18,8
Austria	1,4	1,1
Total EU	**5 617,1**	**5 939,9**

* *Estimation.* *Estimate.* ** *DOM inclus.* *Overseas departments included.*
Source: EurObserv'ER 2012

3.5.2 Ground source Heat Pumps market status

Despite the difficult economic environment, especially in the construction segment the ground source heat pumps market witnessed in 2011 an increase from 2010 as well in the total number of installed applications as the installed capacity and the captured energy. The total number of installed applications grew from 1,031,231 to 1,133,490 or by 9.9%. The installed capacity and the captured energy increased from 12,733.9 MWth to 13,998.1 MWth and from 2,036.4 ktoe to 2,231.2 ktoe, a rise of 9.9% and 9.6%.

Sweden could extend its leading position with an increase of the installed applications from 2010 to 2011 by 7.6% to 407,000. Consequently the installed capacity and the captured energy grew by 7.7% to 4,314.2 MWth respectively by 7.6% to 979 ktoe.
Germany stayed the second largest producer with 243,978 installed applications in 2011, a plus of 9% compared to 2010. The installed capacity and the captured energy increased by 7.1% to 3,000 MWth respectively by 9.1% to 319 ktoe.
Finland as third largest producer had the largest growth among the large producers in the European Union with a total of 74,187 installed applications, an increase by 23.1 % compared to 2010. The installed capacity and the captured energy increased by 23.3% to 1,372.5 MWth respectively by 23.3% to 275.4 ktoe.

Table 20: Quantity installed capacity and renewable energy captured by ground source heat pumps in the EU countries in 2010 and 2011 (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012).

	2010			2011**		
	Nombre *Number*	Puissance *Capacity (MWth)*	Énergie renouvelable capturée *Renewable energy captured (ktep)*	Nombre *Number*	Puissance *Capacity (MWth)*	Énergie renouvelable capturée *Renewable energy captured (ktep)*
Sweden	37 8311	4 005,0	909,3	407 000	4 314,2	979,0
Germany	223 849	2 800,0	292,3	243 978	3 000,0	319,0
Finland	60 246	1 113,0	223,3	74 187	1 372,5	275,4
France	151 938	1 671,3	218,0	162 303	1 785,3	232,8
Netherlands	29 306	745,0	74,9	35 065	864,0	86,9
Austria	60 254	673,4	68,4	66 204	739,6	75,1
Denmark	20 000	160,0	40,6	20 000	160,0	40,6
United Kingdom	18 390	239,1	31,2	20 890	271,6	35,4
Pologne	19 300	257,0	33,5	29 580	360,0	34,6
Czech Republic	13 349	197,0	24,4	15 711	225,0	28,2
Ireland	11 328	151,7	26,2	11 466	155,3	26,8
Estonia	6 382	91,8	18,4	7 411	105,3	21,1
Belgium	13 085	157,0	20,5	13 085	157,0	20,5
Italy	12 357	231,0	16,7	12 357	231,0	16,7
Slovenia	3 948	54,8	9,5	4 194	57,5	9,7
Lithuania	2 221	41,5	8,3	2 221	41,5	8,3
Bulgaria	543	20,6	6,8	543	20,6	6,8
Greece	350	50,0	6,4	350	50,0	6,4
Slovakia	2 000	25,7	3,9	2 000	25,7	3,9
Hungary	4 030	43,0	3,1	4 901	56,0	3,2
Romania	n.a.	5,5	0,7	n.a.	5,5	0,7
Latvia	20	0,3	0,1	20	0,3	0,1
Portugal	24	0,3	0,0	24	0,3	0,0
Total EU	**1 031 231**	**12 733,9**	**2 036,4**	**1 133 490**	**13 998,1**	**2 231,2**

* *PAC hydrothermiques incluses. Tous types d'usages : individuel, collectif, tertiaire ou industriel.* ***Includes hydrothermal HPs. All applications, individual, multi-occupancy, service and industrial sectors.*** ** *Estimation.* ***Estimate.*** *Les données de parcs sont déduites des installations mises hors service.* ***Decommissioned units have been deducted from the base figures. – n.a. (not available) =*** *non disponible. Les décimales sont séparées par une virgule.* ***Decimals are written with a comma. Source: EurObserv'ER 2012***

3.5.3 Political environment

Geothermal technologies are getting more and more competitive, but public support is still necessary for emerging markets and that concerns most of the European countries.

Only ten EU-member states have a fix feed-in tariff for geothermal electricity in 2013. Germany provides the most attractive feed-in tariff with 25ct€/kWh for all projects and additional 5ct€ for Enhanced Geothermal Systems (an artificially created or improved underground reservoir).

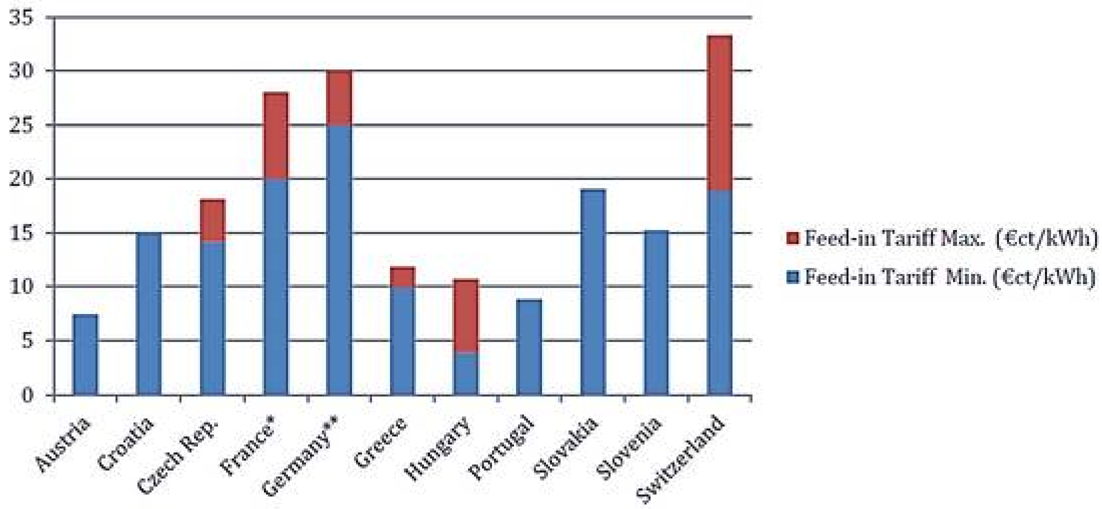


Figure 34: Feed-in tariffs systems for geothermal electricity in European countries (Source: Financing Geothermal Energy, EGEC, 2013).

Estonia, the Netherlands, Slovenia and Italy support geothermal power generation with feed in premiums (bonus paid on top of the electricity market price).Romania, Belgium and the United Kingdom have green certificates in place.

Most of the countries in the EU have investments grants installed to support the geothermal heat production.

Table 21: Financial support schemes for geothermal heat in European countries (Source: Financing Geothermal Energy, EGEC, 2013).

Investment Grants	France (Fonds chaleur renouvelable) for collective office buildings Germany Hungary Greece Poland Romania Slovakia Slovenia Spain
Feed-in tariff	Italy (Conto termico) Netherlands (SDE+) UK (Renewable heat incentive)
Tax rebate/VAT reduction	France: VAT reduction for DH, rebate on tax on revenues for individual housings Hungary Italy Netherlands
Low or zero interest loans	France: for individual housings Germany Hungary Netherlands Poland Slovenia Spain
CO2 tax	Finland, Sweden, Denmark

Concerning geothermal heat generation feed-in tariffs are just granted in Italy, the Netherlands and the United Kingdom. Tax rebates, VAT reductions, low or zero interest loans and CO2 taxes are the remaining support measures.
These measures don't cover all main areas that are worthy of support. Besides the drilling costs the geological risk (the risk to find a resource or not and the risk of naturally decline of the resource) is the key challenge for a geothermal project. Therefore the European Geothermal Energy Council demands a Geothermal Risk Insurance Fund at the EU level (EGEC, 2013).
This additional support could help to achieve the 2020 targets. Especially in the field of geothermal heat generation the actual predictions don't look very positive.
In 2015 the amount of generated geothermal heat in the European Union is expected to be 900 ktoe and therefore the target would be missed by one third or 448 ktoe. In 2020 the gap is predicted to rise to 631 ktoe.

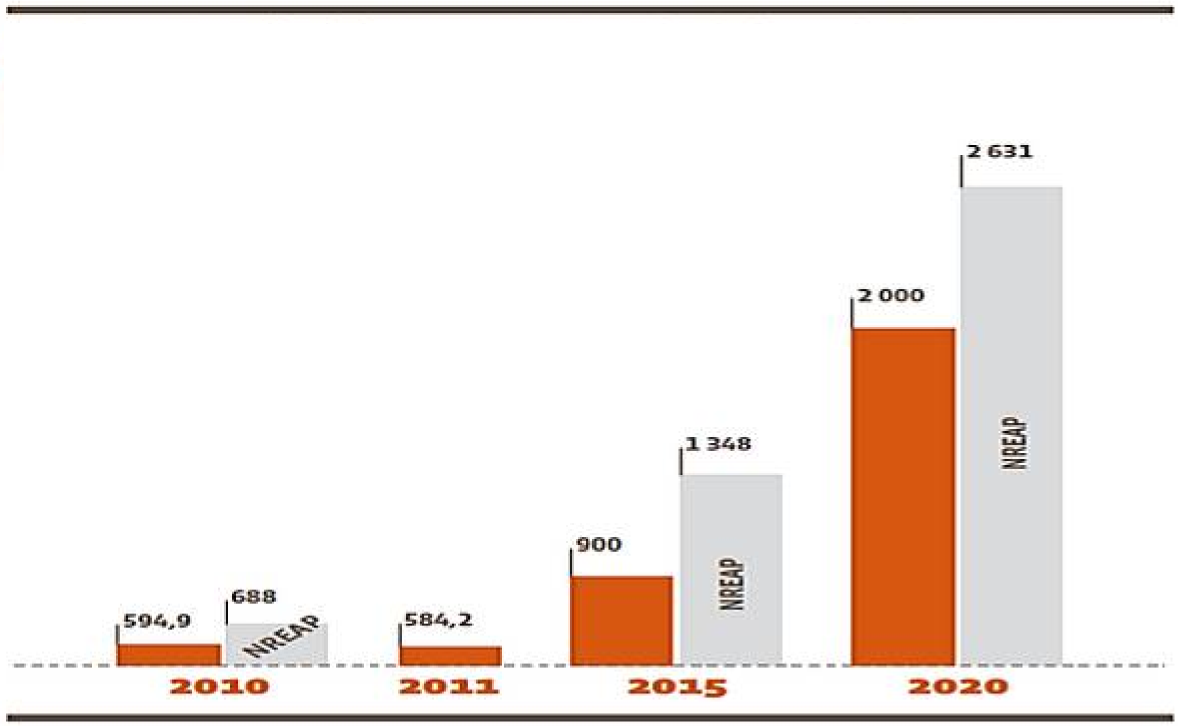


Figure 35: Comparison of the geothermal heat generation trend against the NREAP roadmap in ktoe (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012).

The geothermal electricity generation in the European Union missed the 2010 target by 359.9 GWh. For 2015 a gap of 342 GWh is expected. Because of the predicted increase of new installed binary cycle plants the 2020 is expected to be surpassed by 118 GWh and achieve 11 TWh.

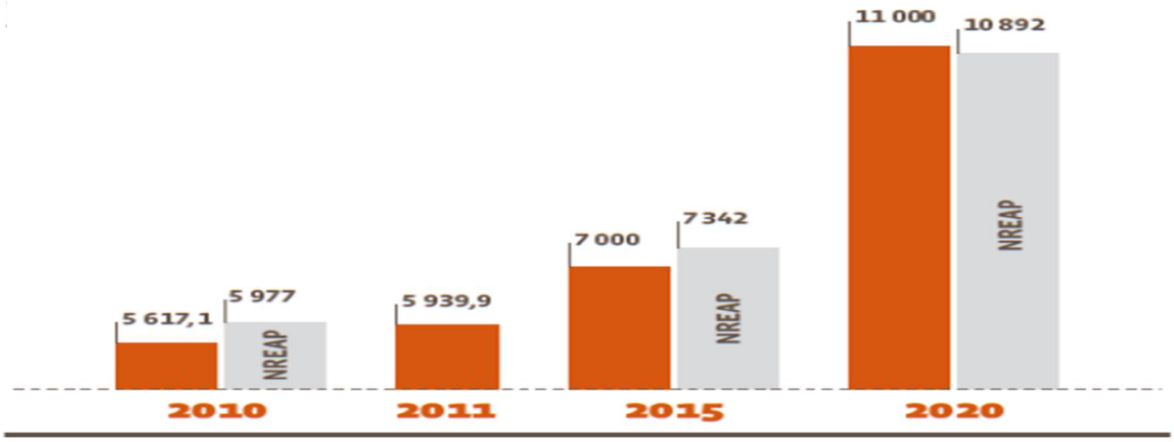


Figure 36: Comparison of the geothermal electricity generation trend against the NREAP roadmap in GWh (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012)

The energy generation from heat pumps in the European Union surpassed the 2010 target by far with plus of 2,036 ktoe. For 2015 a total generation of 3,373 ktoe is expected. That would mean a plus of 630 ktoe compared with the target. In 2020 the predicted 5,533 ktoe would surpass the 2020 target by 716 ktoe.

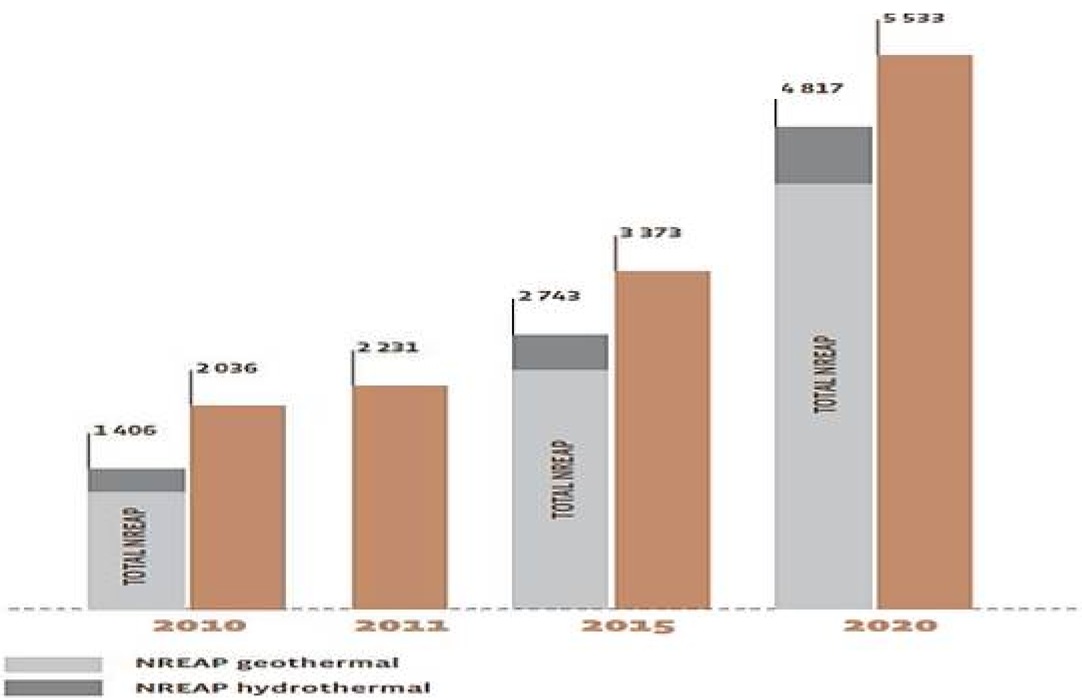


Figure 37: Comparison of the current trend of the renewable against the NREAP (ktoe) (Source: The state of Renewable Energies in Europe, EurObserv'er, 2012).

3.5.4 Trends

In contrast to the other renewable energies geothermal energy has a close connection in the production phase to the oil and gas industry. The drilling costs correspond with the crude oil price and therefore an expected trend towards crude oil price staying on a high level or even increasing has also a negative impact on the drilling costs for geothermal projects.

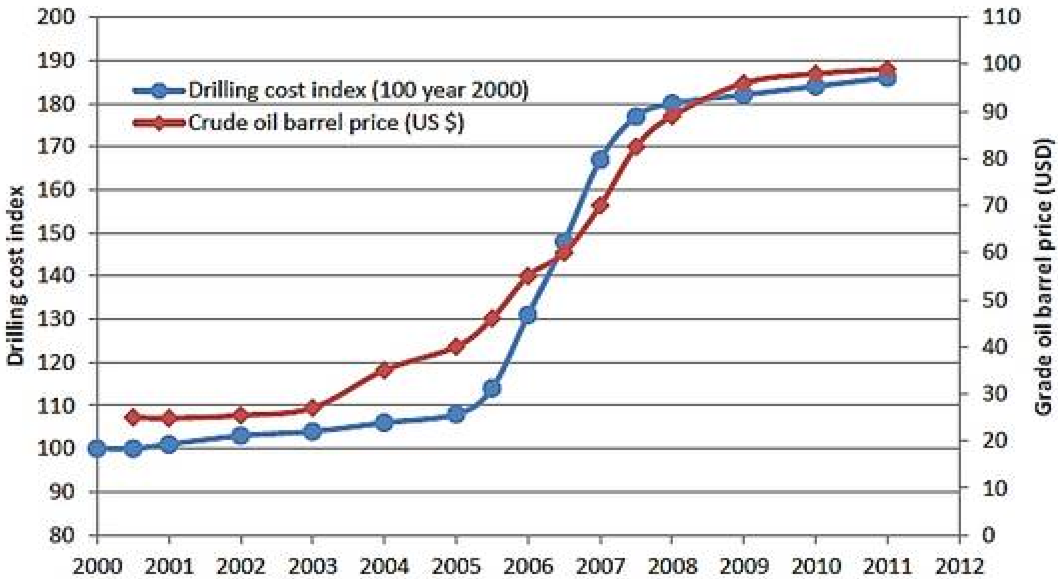


Figure 38: Drilling cost vs. crude oil prices (Source: Report on geothermal drilling, Dumas et al., 2013)

Since *"the drilling costs stand for 30% to 50% of the cost of a hydrothermal geothermal electricity project and more than 50 % of the total cost of Enhanced Geothermal Systems (EGS)"* (Dumas et al., 2013) this development could mean a real threat for future geothermal projects.

Despite this threat EGS projects are expected to represent the future of geothermal energy. In the next years projects in areas of conventional high-temperature hydrothermal resources will still dominate the market, but since the number of areas is limited the long-term trend goes toward EGS. This technology can use the heat of the Earth by creating large heat exchange areas in hot rock. Therefor these projects can reach far more geothermal resources.

Another growing trend goes towards binary plants, which can by using an organic Rankine cycle operate with lower temperatures (70°C-180°C) and therefore further extends the potential sources for geothermal energy generation. The combination of these technologies is expected to lead to 200 GWe of installed capacity by 2050, including 100 GWe hydrothermal electricity capacities and 100 GWe from EGS worldwide (Dumas et al., 2013).

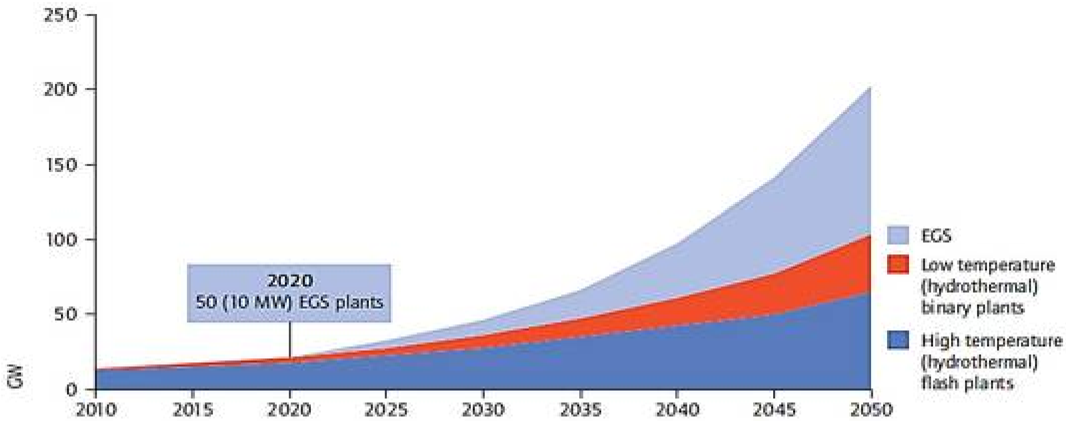


Figure 39: Growth of geothermal power capacities by technology (GW) (Source: Technology Roadmap Geothermal heat and power, IEA, 2011)

3.5.5 Market intelligence perspective

The market overview showed that the geothermal market in the EU has a huge potential, but there are also high risks for the related companies especially through the very high drilling costs. Besides the trends towards new technologies the risk sharing is most important in this market. One opportunity would be to have several experienced and potent business partners involved in one geothermal project. Therefore it would be necessary to scan the market for potential partners.

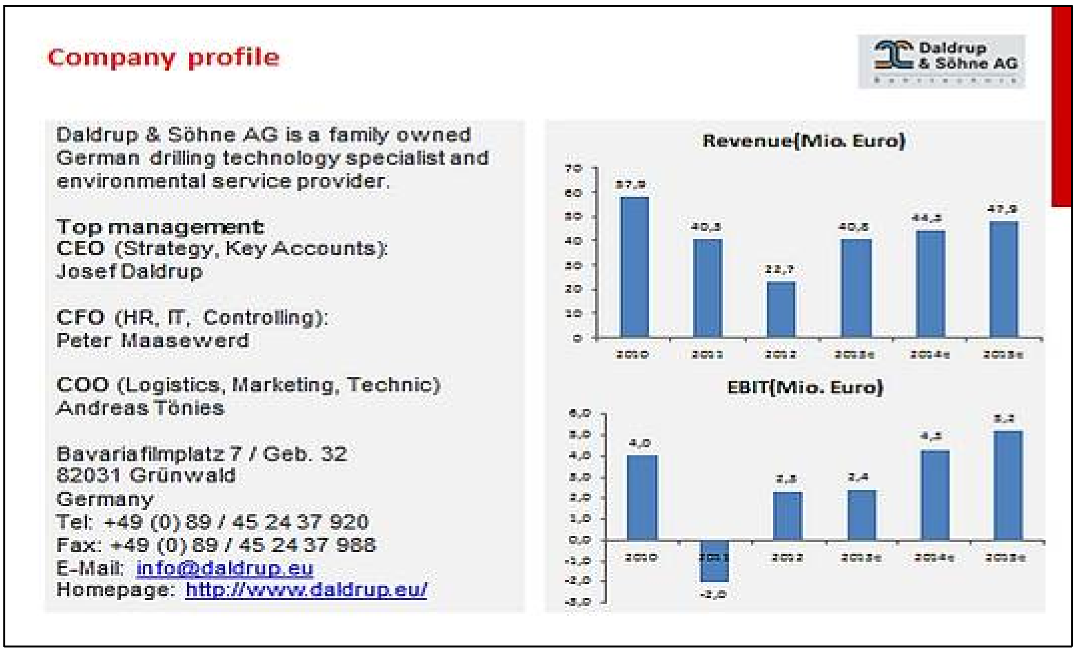


Figure 40: Example of a company profile (Source: Own adaption of the Daldrup annual report 2012, Daldrup, 2013)

One instrument to support the decision makers in their search for a suitable business partner is to provide them with company profiles of potential partners. This is a good example how the next step in the MI-cycle may look like, the deliverables. Here are some examples for a company profile of the Daldrup & Söhne AG, a family owned German drilling technology specialist and environmental service provider. Besides some fundamental data of the investigated company like, revenue and EBIT development and top executives the most important information is whether the company strategy fits to the own one. This company profile shows that Daldrup is planning to grow via strategic alliances and to participate stronger in the in the electricity and heat generation. Such information are essential for the own top-management to decide whether the both company strategies are compatible.

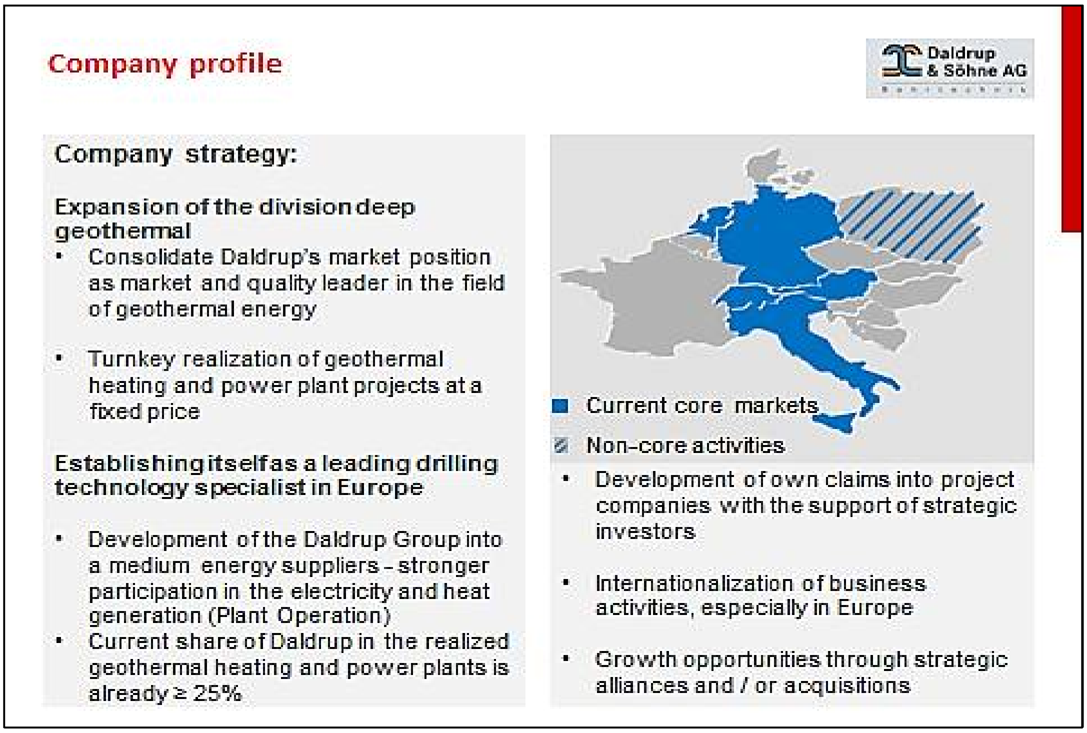


Figure 41: Example of a company profile II (Source: Own adaption of the Daldrup annual report 2012, Daldrup, 2013)

3.6 SUMMARY OF THE STAUS QUO AND THE DEVELOPMENT OF THE RENEWABLE ENERGY MARKET

The renewable energy market in the European Union suffered in the last years from the fear of several governments within the EU of exploding costs of the public subsidies for renewable energies in a, due to the financial and economic crisis already extremely difficult economic environment and as a result the introduction of new taxes and the reduction of the subsidies. Even retrospective measures like the 7% tax on the sale of electricity in Spain were installed. This shows the dependence of the renewable energy market on the political and regulative environment and leads together with the expected technological improvements to a very dynamic market environment. In such a market environment a proactive strategy and quick reaction on market developments is necessary for economic success.

A tailor-made MI-program could deliver the needed information and the advices for such an efficient and prompt acting decision making process. Scanning the internet is a very good and cost effective way to collect the needed information. Since this secondary research method delivers an information overload human intelligence work is needed. A dedicated analyst has to design and continuously update the search strings and filter the results. After extracting of the relevant information the analyst writes a short abstract and thereafter the information is stored and distributed via a MI-portal.

The MI-portal also helps to create an internal network and in doing so improving the knowledge management within the company. The establishment of an external network in the renewable energy and related markets can be very useful. The MI-team can profit from the experience from other MI-experts concerning the daily MI-work, but also from their core business experience.

Single interviews with experts or the visit of a relevant trade fair would be a good start to establish a network. In case a network is already established and/or you need a lot of experts, even from different countries an online survey is a very good and cost effective way to get the needed information.

Furthermore a closer analysis of new occurring products in this technology-driven market is essential to identify the potential risks and chances of these products for the own company. A short SWOT-analysis (Strengths, Weaknesses, Opportunities, and Threats) can deliver the base for the decision how to react on this new product development.

Besides the trends towards new technologies the exchange of experience and the risk sharing is very important in the renewable energy market – especially for huge and cost intense project. One opportunity would be to involve several experienced and potent business partners in one of these projects. An instrument to support the decision makers in their search for a suitable business partner is to provide them with company profiles of potential partners. One key information a company profile should provide is whether the strategy of the investigated company is compatible with the own one.

4 CASE STUDIES

4.1 STATOIL CASE

4.1.1 Case description

Statoil ASA is a multinational oil and gas company with 23,000 employees worldwide and a revenue of 86.362 billion€ in 2012, mainly owned by the Norwegian state (Statoil, 2013).

In 2006 Statoil started to implement an own Market Intelligence program within the company. Up to this time Statoil had no established structure in its Market Intelligence activities. These activities were just started on demand and needed substantial help from external consultant firms.
In 2007 the MI program was still very basic and contained general news feeds and ad-hoc researches and analysis. It became obvious that an enlargement of the MI-team is necessary to provide a higher quality. In the same year Statoil merged with Norsk Hydro and this merger was taken as the occasion to also merger the MI-team with the strategy team within the new structured company. As result a twelve- man team was established – four responsible for the strategy process and eight for the MI-program.
In 2008 the bigger team could extend its service and installed an own MI-tool to reach more people company wide. Because of the increasing demand of high quality service in 2009, well trained MI-experts were hired by Statoil to complete the existing MI team.
Finally in 2011 the MI-program was in the shape to fulfill its duty as news collector, researcher, analyst and strategic adviser for the whole company as originally planned in 2006 (Hedin et al., 2011).

4.1.2 Results

In 2011 the internal MI-program of Statoil had 15 dedicated MI experts and 5 experts working on the strategy process. A pool of 15-20 external experts was installed to work on demand for the internal MI-team.500 key-decision makers are regularly supported by the MI team, 2,500 employees received news reports and all

employees had access to the MI-tool. Main deliverables were external news reports, M&A analysis, strategy reports and CEO briefings.
After the successful implementation Anders Marvik, the designated MI-team leader summarized ten key success factors for this positive process (Hedin et al., 2011):

1. **Top management sponsor**
   To develop its full potential a MI-program needs a patron on top management level. This helps you to get more acceptances and a stronger voice in the strategic planning of the company and also a gives you support if you recommend changes.
2. **Resources**
   The establishment of a MI-program is a time consuming and particularly at the start an associated with costs task, but it is in the long run cheaper and providing more quality than external consultants can offer. Another advantage is the included knowledge management of the already existing expertise within the company
3. **Location in an industry hub**
   For Statoil it was the better choice to establish the MI-team in London than within its headquarter in Norway. The closer contact to competitors, external analysts and the financial center of the city of London and the possibility of personal interactions with them provided a big advantage in the daily work for the MI-team.
4. **Being part of the strategy process**
   To be recognized as an integral part of the strategy process guarantees that you get access to the top decision makers and that the strategy is based on your advice.
5. **Stay involved in the daily business**
   Knowledge of the daily business of the company ensures that you are possible to ask the right questions and provide the fitting result at the time needed.
6. **Experts in the MI-team**
   A MI-team needs experience and curiosity. Especially during the starting phase you need real experts to establish the program in professional way and to pick curious talents from inside or outside the company to enlarge the team.

7. **Differentiated MI-team**

   Especially for an international company like Statoil it's very important to have also a multinational MI-team. Not only because of the language skills but also because the different business cultures all over the world. Also different educational backgrounds like technical, business and politic studies are helpful to fulfill all the different tasks of an MI-team.

8. **Strong internal and external networks**

   To profit from internal and external experts is key to better understand the internal needs and existing knowledge and improve the internal results via reflection with the experience of external experts. In order to stay a rather small and cost effective MI-team the best way is to outsource work intensive tasks like news and information collecting and focus on high level analysis and advisory.

9. **Grounded conclusions**

   The collection of news, information and external reports is important, but just the base for the analysis and advisory. A successful MI-team has to provide at least the same quality concerning content, design and hands-on recommendations like external consultants.

10. **Sharing is power**

    Involvement of the whole company on different levels is important for the success of a MI program. High level reports for the decision makers, news report for the middle and lower management and access for all employees.

Table 22: MI-Roadmap (Source: Hans Hedin et al: "The Handbook of Market Intelligence", Wiley & Sons, Hoboken, 2011).

Description	Informal MI "Firefighters"	Basic MI "Beginners"	Intermediate MI "Coordinators"	Advanced MI "Directors"	World Class MI "Futurists"
Intelligence Scope	No specific focus has been determined. Ad hoc needs drive the scope.	Limited scope, seeking quick wins. Focus typically on competitors or customers only.	Wide scope with the attempt to cover the current operating environment comprehensively.	Analytical deep dives about specific topics complement the comprehensive monitoring of the operating environment.	Broad, deep and future-oriented scope that also covers topics outside of the immediately relevant operating environment.
Intelligence Process	Reactive ad hoc process puts out fires as they emerge. Uncoordinated purchases of information.	Needs analysis made. Establishing info collection from secondary external sources. Little or no analysis involved in the process.	Secondary info sourcing complemented by well established primary info collection and analysis.	Advanced market monitoring and analysis processes established. Targeted communication of output to specific business processes and decision points.	Intelligence process deeply rooted in both global and local levels of the organization. MI fully integrated with key business processes; two-way communication.
Intelligence Deliverables	Ad hoc deliverables quickly put together from scratch.	Regular newsletters and profiles complement ad hoc deliverables.	Systematic market monitoring and analysis reports emerge as new, structured MI output.	Two-way communication is increased in both production and utilization of MI output. Highly analytical deliverables.	High degree of future orientation and collaborative insight creation in producing and delivering the MI output.
Intelligence Tools	Email and shared folders as the primary means for sharing and archiving information.	Corporate intranet is emerging as a central storage for intelligence output.	Web-based MI portal established that provides access to structured MI output. Users receive email alerts about new info in the system.	Sophisticated channeling of both internally and externally produced MI content to the MI portal. Multiple access interfaces to the portal in use.	Seamless integration of the MI portal to other relevant IT tools. Lively collaboration of users through the MI portal.
Intelligence Organization	No resources specifically dedicated to MI. Individuals conducting MI activities on a non-structured basis.	One person appointed as responsible for MI. Increasing coordination of MI work in the company. Loose relationships with external info providers.	A fully dedicated person manages MI and coordinates activities. Centralized, internally or externally resourced info collection and analysis capabilities exist.	Advanced analytical and consultative skills in the intelligence team. MI network with dedicated resources in business units for collecting local market info. Non-core MI activities outsourced.	MI team has reached the status of trusted advisors to management. Internal MI network collaborating actively. Internal MI organization smoothly integrated with the outsourced resources.
Intelligence Culture	No shared understanding exists of the role and benefits of systematic MI operations.	Some awareness exists of MI, but the organizational culture overall is still neutral towards MI.	MI awareness in a moderate level. Sharing of info is encouraged through internal training and marketing of MI.	MI awareness is high and people participate actively in producing MI content. Top management voices its continuous support to MI efforts.	A strong MI mindset is reflected in the way people are curious towards the operating environment and co-create insights about it.

According to Anders Marvik it was also very important to have a vision of the future MI-program and follow a roadmap right from the start.

4.1.3 Lessons learned for renewable energy companies

For renewable energy companies it's very important to see that even one of the top international traditional energy companies started to rethink its strategy finding process and invested 5 years and some money to establish an own MI-program. This is especially remarkable due to the fact that in an even more dynamic market environment like the renewable energy market you have to compete not only with other renewable energy companies, but also with the traditional energy companies. Therefore a renewable energy company, usually not as big and well positioned as Statoil, has even more to react quickly on market developments and should try to even anticipate such developments and act proactively. The example Statoil also shows that a relatively small team of MI-experts – 15 people for a company with 23,000 employees- can deliver the information and analysis for a proactive strategy. In average a company with the revenue of Statoil has a MI-team with a headcount of 28, whereas a company with a revenue between 100 million € and 1 billion€ just need in average 6 designated MI-experts.

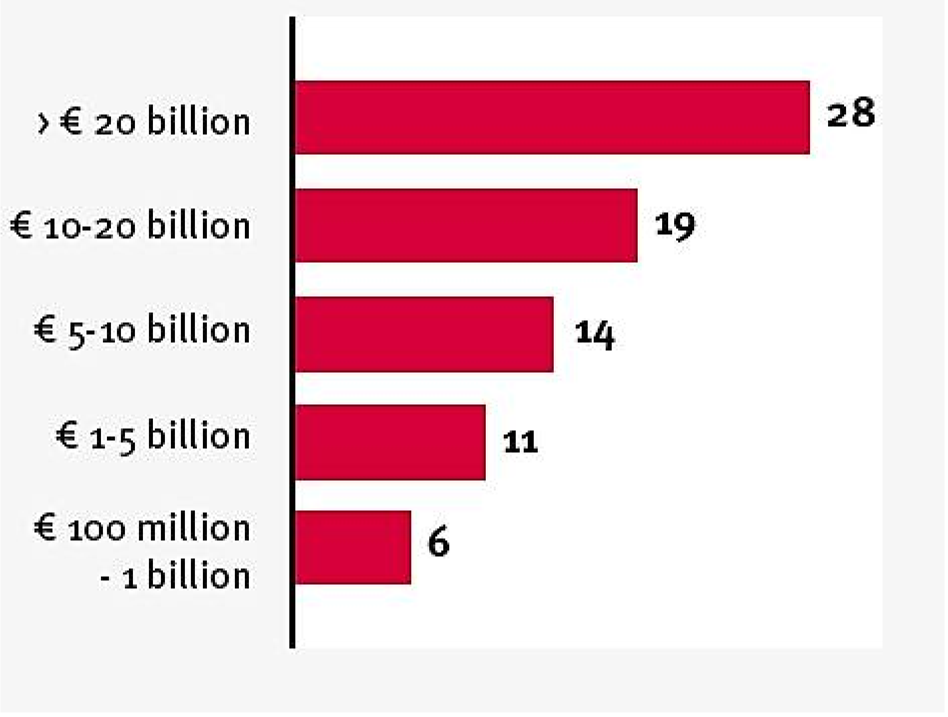


Figure 42: Average number of people in the market intelligence team (x-axis) by company size (y-axis) (Source: Global Market Intelligence Surveys, GIA, 2013).

The key-success factors derived from the experience Statoil made during the establishment are also applicable for renewable energy companies. Especially the importance of an external network is relevant for renewable energy companies. Not only can they profit from the experience from other MI-experts concerning the daily MI-work, but also from their core business experience. For instance companies in the field of geothermal energy production can profit from a good network in the oil and gas business. Not only concerning the good information sources for common areas like drilling, but also regarding a potential cooperation.

4.2 ABB CASE

4.2.1 Case description

ABB, based in Zurich, Switzerland, is a global leader in power and automation technologies with 150,000 employees and a revenue of 39.336 billion$ in 2012 (ABB, 2013).
Daniel Niederer, Head of Strategy Controlling and Operations, was responsible for the establishment of a MI-program within ABB starting 2004. He described the situation as follows: *"Back then, we came to the somewhat embarrassing conclusion that investment banks and consultants knew more about ABBs' competitive situation than we did ourselves!"* (Hedin et al., 2011)
The main challenges at the start of the program were:

- MI had no internal network
- MI was completely uncoordinated and the awareness of its existence within the company was rather low
- No designated leader for the MI work

As first step to establish a well-structured MI program the standard MI-cycle was taken as a framework. Secondly a matrix of the main intelligence topics was established (Hedin et al., 2011):

Strategic intelligence

- Monitoring of the long-term strategy of the competitors
- Own long-term targets
- Mergers and acquisitions
- Portfolio analysis

- Market share
- Research and development
- Financial benchmarking

Operational intelligence

- Product comparison
- Detail analysis of product features
- Comparison of go to market strategies
- Outplay strategies concerning competitors' products

At this time the coordination and responsibility problems were solved. To increase the awareness and to create an internal network an own MI portal was established. Furthermore regular seminars and workshops were installed.

4.2.2 Results

Besides the MI portal and the workshops the standardization of the MI-products was the key success factor of the ABB MI-program. All reports, analyses and presentations got the same design and structure. This high recognition value contributed much to the today's full awareness of the MI-program within the whole company. Via the seminars and workshops with decision makers and experts a strong internal network was established. The important direct connection to the top-management was established via a weekly report to the CEO and the CFO. Furthermore quarterly reports for the whole management were conducted. These deep analysis reports covered the markets, competitors and vertical industries. Because of this high quality service portfolio the MI-team became the preferred contact of the top management for information and advice concerning strategic decisions.

Daniel Niederer exemplified the contribution of the MI-team to the decision finding process as follows*: "The management was evaluating the potential divestment of a certain part of a business. The perception was that the business did not seem to have a sound outlook for the future since the market growth was limited. We did our analysis and came to the conclusion that the future capital expenditures of the particular vertical industry where this business was active in, were in fact likely to increase quite dramatically. Based on this intelligence, the divestment plans were* *stopped. It seems now that our analysis was indeed right, the industry sector picked up and ABB is making good business in that field." (Hedin et al., 2011)*

4.2.3 Lessons learned for renewable energy companies

The ABB example shows how important it is to analyze the own knowledge of the company's market and competitive position. If, like in the case of ABB, the analysis shows that this knowledge is rather low it's time for improvement measures. To take the standard intelligence cycle as first framework for an own MI-program is both, a good and an obvious decision. It's a well proven and easy to understand system and therefore easy to promote within the company. The second framework used by ABB is a structured need analysis that helps the MI-team to focus on the most important KITs. These frameworks are a solid base for the development of an own MI-program, not only for ABB, but also for renewable energy companies.
Furthermore the method to establish an internal network by organizing seminars and workshops is a good example how to get the awareness and cooperation of the employees by direct involvement. The quoted ABB example shows how a well-established MI-program can contribute in the decision making process and help to take the occurring chances. This positive effect of MI-work is widely recognized - according to the Global Market Intelligence Survey 2013 of the Global Intelligence Alliance 80% of the over 1,200 decision makers and market intelligence managers responding to the survey thought that their company has benefited from market intelligence.

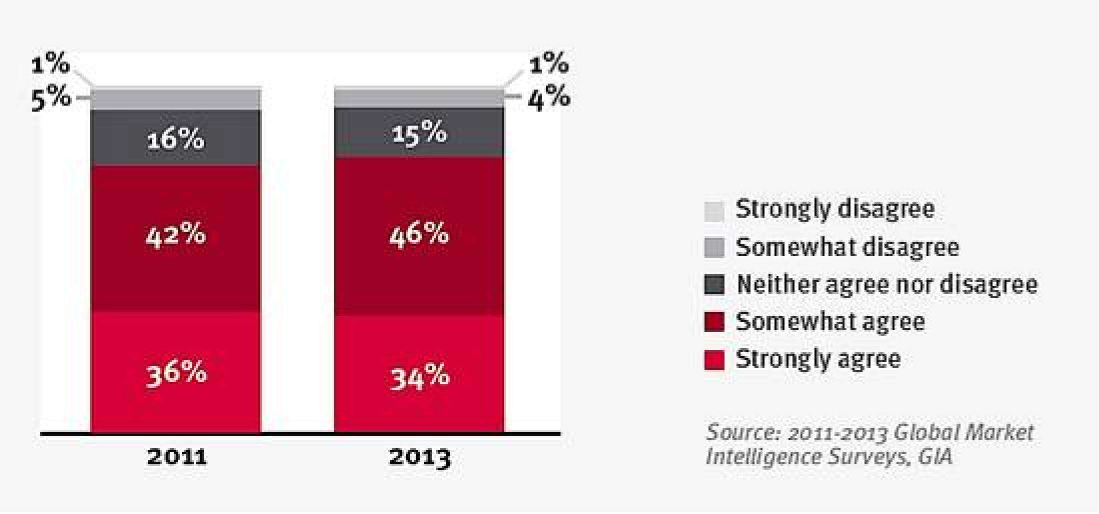


Figure 43: Our company has benefited from market intelligence (Source: Global Market Intelligence Surveys, GIA, 2013).

4.3 SUMMARY OF THE CASE STUDIES

From 2006 to 2011 Statoil implemented an own MI-program. During this time period the MI-team increased to 15 dedicated MI experts and 5 experts working on the strategy process. Even this relatively small team of MI-experts – 15 people for a company with 23,000 employees - can deliver the information and analysis for a proactive strategy with external support. Therefore a pool of 15-20 external experts was installed to work on demand for the internal MI-team. In 2011 500 key-decision makers are regularly supported by the MI team, 2,500 employees received news reports and all employees had access to the MI-tool. The quantitative and qualitative improvement of the MI-team was besides the establishment of an internal and external network and the involvement of the whole staff via MI-portal one of the key success factors, which are direct applicable for renewable energy companies.
ABB started in 2004 the establishment of a MI-program within the company after realizing, that investment banks and consultants knew more about ABBs' competitive situation than they did themselves. The standard intelligence cycle was taken as a framework for the MI-program. Seminars and workshops with decision makers and experts together with the standardization of the MI-products were the key success factors of the ABB MI-program and established a strong internal network.

5 CONCLUSION

The great potential of a structured Market Intelligence process for the optimization of the decision making process in renewable energy companies was shown on several examples in all segments of the renewable energy market in the European Union. Furthermore the case studies of two major players in the European energy market proved the improvements by establishing an own Market Intelligence program. The knowledge of the company's market and competitive position was as developed as the capability to react on market developments. Additionally the importance of a well-established Market Intelligence program for the continuous enhancement of the corporate strategy was evidenced.

The market overview showed that the renewable energy market in the European Union is very dependent on the changes of the political and the regulative environment and will witness major changes through expected technological developments. These circumstances create a dynamic market environment that requires a quick and based on profound knowledge reaction on market developments. A well-established Market Intelligence program can provide the decision makers within a renewable energy company with a solid information basis and delivers advices for the reaction or can even anticipate such developments and help to act proactively.

The Statoil case showed furthermore that even a well-positioned big player in the traditional energy market had to improve its decision making process and therefore established an own Market intelligence program. For companies in the renewable energy segment this is even more important. On the one hand they have to cope with an even more dynamic market environment and on the other hand they have to compete not only with other renewable energy companies, but also with traditional energy companies. In contrast to the big player in the traditional energy sector most of the renewable energy companies have not the financial background to compensate inappropriate strategic decisions.

Therefore the main conclusion is that a profound market knowledge and analysis that can be provided by a well-established Market Intelligence program is essential for a renewable energy company to remain competitive and develop even within this dynamic market environment.

Taking into account that the renewable energy sector has to - in all likelihood - prove in the next years that it is not just a due to ideological reasons subsidized segment, but a competitive substitute for fossil energy sources this is even more important.

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