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MASTER THESIS

FUNDAMENTAL CHANGES IN THE EUROPEAN ENERGY SECTOR

IMPLICATIONS FOR THE CZECH ELECTRICITY COMPANY

The case study of CEZ Group

Ondrej Sveda - 311506

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ABSTRACT

The thesis pursues fundamental changes in the European energy sector and implications it has for the value chain of the Czech electricity company - CEZ Group. The characteristics of individual drivers and implications of the changes are necessary to understand the way the traditional energy business model is transforming into decentralized business model with active consumers and new technologies. Furthermore, this thesis provides various existing and future instruments and regulatory interventions that the European Energy Policy applies to achieve its core goals of energy competitiveness, sustainability and security of supply. Moreover, specifics of the Central European and Czech electricity markets, alongside with company analyses are needed to fully assess the extent of implications the fundamental changes are causing to the value chain of CEZ Group.

Key words: energy, fundamental changes, EU, commodity prices, RES subsidies, decentralized generation, EU ETS, liberalization, capacity mechanisms, Czech electricity market, value chain, CEZ Group

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LIST OF ACRONYMS

CAPEX – capital expenditures

CEE – Central and South-eastern Europe

CEZ – CEZ Group / CEZ, a.s.

CfD – Contract for Difference

CHP – combined heat and power gen

CZ/CZE – Czech Republic

CZK – Czech Koruna

EBIT – Earnings before interest and tax

EC – European Commission

EEX – European Energy Exchange

EIA – US Energy Information Agency

ERO – Energy Regulatory Office

ES – electricity system

EU – European Union

EUR - Euro

ETS – Emission Trading System

GDP – Gross Domestic Product

GFPS – gas fired power plant

HE – hydroelectric power plant

IEA – International Energy Agency

IRR – Internal Rate of Return

MC – Market Coupling

NPP – nuclear power plant

NWE – North-western Europe

O&M – operation and maintenance

OECD – Org. for econ. coop. and devel.

OPEX – operational expenditures

OTE – Czech Market Operator

PV – photovoltaic plants

PXE – Power Exchange Central Europe

R&D – research and development

RES – renewable energy sources

SEC – State Energy Conception

T&D – transmission and distribution

TPS – thermal power station

TSO – Transmission System Operator

WEO – World Energy Outlook

WPP – wind power plant

INTRODUCTION

The power sector is a complex system of thousands of power plants, millions kilometers of transmission and distribution network lines and billions of end-users, all functioning together with system operators balancing electricity demand and supply in real time. There are many factors influencing the pace in which electricity demand grows, such as gross domestic product (GDP), electricity prices, standards of living, population growth, number of people with access to electricity supply, and the extent of the energy-efficient technology deployment. Nevertheless, today, demand for electricity grows more than demand for any other final form of energy.

The generation mix development depends mainly on the relative economics of different energy technologies and climate conditions, with the account of the capital expenditure and financing conditions to build the power plant, policies to promote or limit specific technologies development, the availability of domestic fuel resource, fossil-fuel prices, emission allowance pricing (if applicable), the age of the existing power plant fleet and the power market structure.

The decision on which power plants are run to meet electricity demand typically depends on the variable costs of their operation. Plants with the lowest variable costs are generally dispatched first; however, much depends on how the local power market is organized. There are two basic designs: fully liberalized markets and fully regulated systems. Nevertheless, in practice, most systems have some features of both designs. Worldwide, most power is generated in relatively highly regulated systems. The design of the system determines how prices are formed and the conditions for investment. Policy interventions have to be adapted to the design of the individual system. (WEO, 2013, p.170)

Problem statement

The European energy sector is undergoing fundamental changes led by the combat with climate change. The highly subsidized expansion of renewable energy sources (RES), especially wind and photovoltaic, is causing the margins and utilization of conventional power stations to decline. RES nature as decentralized generation is also causing difficulties for the grid and overall system stability. In addition, the declining energy demand and rapidly increasing and volatile supply of electricity via RES decreases the wholesale prices. Adding very low prices on CO2 emission permits, market becomes very unpredictable and very risky for any long-term investments to conventional sources, which due to their higher variable costs require higher electricity prices. All of this is having a significant effect on earnings and management of energy companies.

However, conventional power plants will still continue to play a significant role in the European energy landscape. They must be capable of stepping in when the wind is not blowing or the sun is not shining. That will still be the case even in 2050, and thus flexible and predictable conventional power station capacity will still be required.

Thus, energy companies will develop from an energy supplier towards a capacity provider. Therefore, they have to reorganize their generation fleet so that they can generate power more flexibly and more efficiently. Within the current market design, however, the economic operation of conventional assets is hardly manageable. The market model will have to change. In order to ensure security of supply, instruments that compensate for the provision of capacity are needed. In this context it has to be considered that old power stations must not be played off against new ones. Also, special technologies or market players must not be disadvantaged. Here, a market-based, all-European approach is needed.

Research question

The aim of the master thesis it to analyze the various drivers and implications of the fundamental changes on the European Energy Sector that are causing the current energy business model to change. The thesis is focusing on the Central European region and especially on the Czech Electricity Market.

In order to answer the primary research question "What are Implications of Fundamental Changes in the European Energy Sector on the value chain and structure of Czech Energy Company?" it is also necessary to analyze the dominant player of the Czech electricity market - CEZ Group.

Since CEZ Group belongs to TOP 10 energy companies in Europe, it is necessary to research "How is the company dealing with the problem?" and "How is company's value chain reacting to the changes?".

Fundamental Changes in the European energy sector is very wide and complex dilemma, which makes it impossible in the extent of master thesis to fully describe. That is why I am aiming to provide an insight into the problem, mentioning the most important drivers and implications, and identify at least the most important market tools that are accompanying the transformation of company's value chain.

Motivation and purpose

The reasons why I chose this topic are obvious. I believe that fundamental changes in the energy sector are very important and up-to-date problem that influences our everyday life – especially the price of electricity and security of supply. Even though that the current crises came as a surprise, the energy industry functions in long-term phases and the changes are only slow and gradual. I believe that companies need to be aware of the transformation and well prepare for it in advance. Technologies are quickly developing and changing the traditional energy environment.

Also, since I am from the Czech Republic, I chose to focus on this market and its dominant player that is a vertically integrated company in all parts of the electricity value chain. This allows me to see the whole picture of how is each part of the system affected.

Outline of the thesis

The thesis is structured into 4 parts. The first part discusses the theoretical framework of value chain management – identifying the strategy, competition and competitive advantage of the company in general. Further, this part analyses the current and future electricity value chain. The second part describes methods used in preparing the research design, which is based on the social constructivist approach. Further, data collection via interviews, data analysis techniques, and quality of research are discussed. The third major part concerns the empirical findings and is divided into 4 sub chapters focusing on description of the changes, European level, Regional and national level, and Company level. He final forth chapter discusses the findings and answers the research questions.

1. FRAME OF REFERENCE

In this chapter, important concepts and components that underpin the relevant theory to the research question are introduced. Here, value chain management theory is discussed. The importance of value chains as a key part of business strategy for maintaining competitive advantage is explained. Existing processes of the value chain are presented, as well as the profit margin creation through managing the linkages between those activities of the organization. Then, functioning of the value chain system within the electricity industry is explained with the focus on current and future design. In the end of this chapter concluding summary is presented.

1.1. Value Chain Management Theory

A strategy means the plans and actions necessary to achieve the goals of an organization. The manager must consider the strengths and weaknesses of their own organization and its competitors and to know the external environment threats and opportunities. The most important theory about the business strategies was elaborated by Michael Porter in his book “Competitive strategy: Techniques for Analyzing Industries and Competitors” in 1980. In this book Porter analyzed the various sources of environmental threats and opportunities and described how companies could position themselves in the marketplace.

Figure 01: Porter’s business strategy formation process

Phase 1: What is the company doing now ?
1. Identify current strategy
2. Identify assumptions

⇩

Phase 2: What is happening in the environment ?
1. Identify key factors for success and failure in the industry
2. Identify capabilities and limitations of competitors
3. Identify likely government and societal changes
4. Identify company’s strengths and weakness relative to competitors

⇩

Phase 3: What should the company do next ?
1. Compare present strategy to environmental situation
2. Identify alternative course of action
3. Choose best alternative

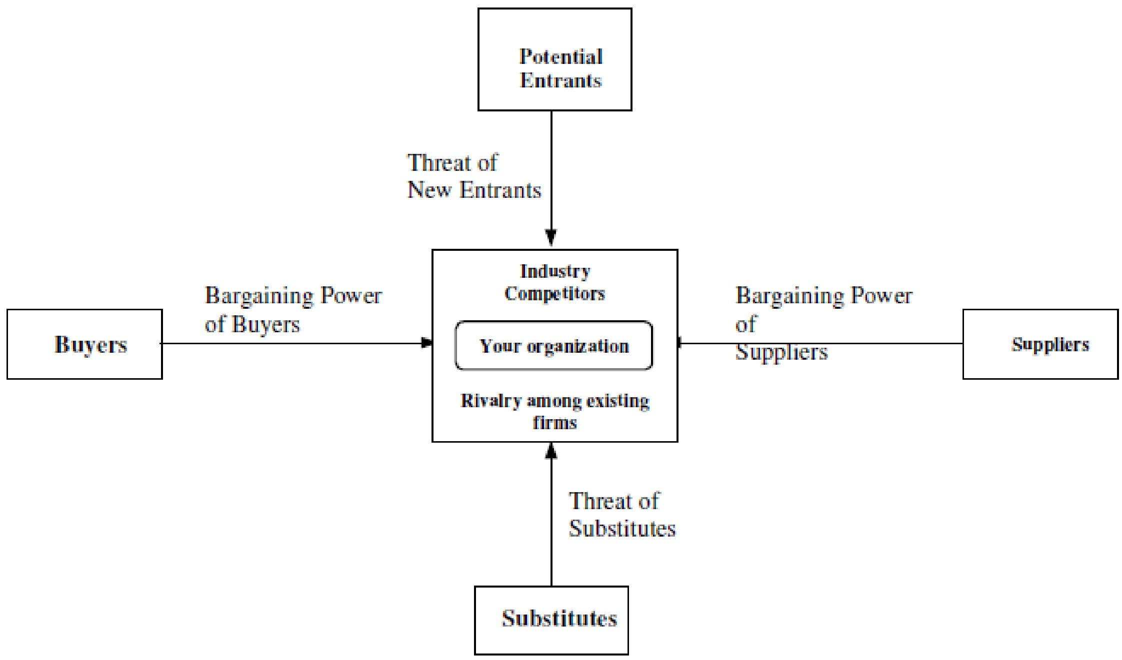
Source: Porter, 1980, p.299

Porter defines business strategy as "a broad formula for how a business is going to compete, what its goals should be, and what policies will be needed to carry out these goals." He recommends for strategy formation of the three phases process: determine the current position of the company, determine what is happening in the environment, and determine a new strategy for the company (see Figure 01).

Porter's model of competition

The Five Forces diagram reflects the main idea of Porter's theory of competitive advantage, defining the rules of competition in any industry (see Figure 02). The five forces are: industry competitors, buyers, suppliers, substitutes, potential entrants.

Figure 02: Porter's Five Forces diagram



Source: Porter, 1980, p.3

The buyers want to buy the company's products at the lowest prices. There are two situations: if the company is the only source the company will keep higher prices, or the invert situation, if there are many companies with similar prices who made the product, it will be obligated to reduce the prices. Suppliers want to sell their products for a higher price. If the suppliers are the only source of a needed product or if there is lots of demand for a relatively rare product, then suppliers will tend to have more power and will increase their prices. If the suppliers products are widely available or available more cheaply from someone else, the company (buyer) will try to force the supplier's price down.

Companies in every industry also need to watch to see that no products or services become available that might function as substitutes for the products or services the company sells. At a minimum, a substitute product can drive down the company's prices and even can product bankruptcy. Finally, there is the threat that new companies will enter an industry and the competition will increase, driving up the cost of products and lowering each company's profit margins. (Porter, 1980, p.6)

Porter’s Value Chain Analyses

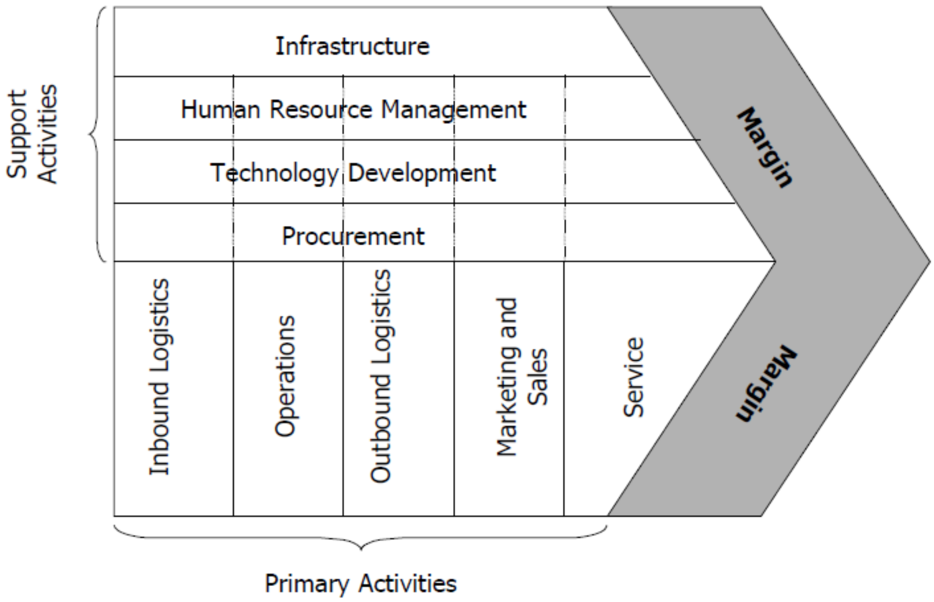
The value chain analysis describes the activities within and around an organization and relates them to an analysis of the competitive strength of the organization. This analyses was first used by Michael Porter in his book “Competitive Advantage: Creating and Sustaining superior Performance” in 1985.

The term value refers to value that a customer perceives and is willing to pay for. The idea of the value chain is that each particular activity in the chain or sequence adds some value to the organizations final products or services. It's assumed that if you asked the customer about each of the steps, the customer would agree that the step added something to the value of the product. This is because an organization is more than a random compilation of equipment, people and money. As long as these production factors are arranged into systems and systematic activates it will become possible to produce something and hence offer a value proposition for which customers are willing to pay a price. (Porter, 1985, p. 46)

There are also some activities or steps that don't add value directly, but facilitate adding value. Therefore, Porter differentiates between primary activities (value adding) and support activities (value-enabling). Primary activities are directly concerned with the creation or delivery of a product or service. There are five primary processes: inbound logistics, operations, outbound logistics, marketing and sales, and service. Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency. There are four support processes: procurement, technology development, human resource management, and infrastructure (see Figure 03).

Important role in the value chain analysis then play the linkages between activities. They are flows of information, goods and services, as well as systems and processes for adjusting activities with the overall aim of seamless cooperation between the value chain activities. The source of competitive advantage then occurs from the ability to perform particular activities and to manage the linkages between these activities in an organization.

Figure 03: The basic model of Porter's Value Chain



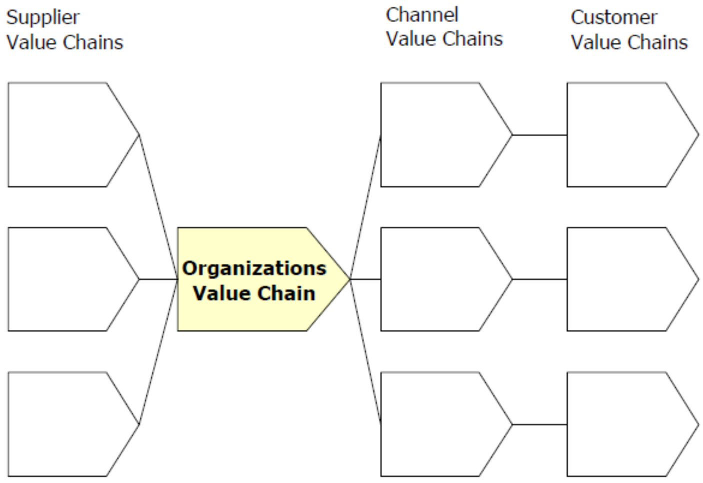
Source: Porter, 1985

The resulting margin implies that organizations realize a profit margin that depends on their ability to manage the linkages between all activities in the value chain. Many individual sub processes that contribute to the cost of producing a given line of products must be combined to create a complete value chain. Once all the costs are combined and subtracted from the gross income from the sale of the products, one derives the profit margin associated with the product line. In other words, the organization is able to deliver a product or service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain. (Porter, 1985, p. 48)

The term value chain is suggesting that the chain was made up of a series of activities that added value to products the company sold. Some activities would take raw materials and turn them into an assembled mechanism that sold for considerably more than the raw materials cost. That additional value would indicate the value added by the manufacturing process. The key reason to focus on value, however, is, ultimately, to identify activities that are non-value-adding activities. These are activities that have been incorporated into a process, for one reason or another, that no longer add any value to the final product. One goal of many process redesign efforts is to eliminate or minimize the number of non-value adding activities in a given process. (Porter, 1985, p.24)

In most industries, however, it is rather unusual that a single company performs all activities in the value chain by itself. Most often, organizations are specialized elements of a value system or supply chain in the given industry. Depending on the size of the corporation, organizations can function among many parts of this value system. Hence, value chain analysis should cover the whole value system in which the organization operates (see Figure 04).

Figure 04: Value chain analyses of the whole value system



Source: Porter, 1985

However, there is only a certain value of profit margin available within the whole value system. The overall margin is the difference of the final price the customer pays and the sum of all costs incurred within the production and delivery of the product or service. This margin is then spread across the suppliers, producers, distributors, customers, and other elements depending on the structure of the value system. Each member of the value system will use its market position and negotiating power to acquire a higher proportion of this margin. Nevertheless, members of a value system can also cooperate in order to improve their efficiency and to reduce their costs, and thus all benefit by achieving a higher total margin.

Porter's Theory of Competitive Advantage

In his book, Porter has defined the competitive advantage and shows how value chains were the key to maintaining competitive advantage. He considered that a strategy depends on defining a company position that the company can use to maintain a competitive advantage. A position simply describes the goals of the company and how it explains those goals to its customers.

A competitive advantage occurs when your company can make more profits selling its product or service than its competitors can. The managers have to establish a long-term competitive advantage. This provides the best possible return, over an extended period, for the effort involved in creating a process and bringing a product or service to market. A company with a competitive advantage is not the largest company in its industry, but is the one that is selling a desirable product and is producing great profits. There are two variables that determine a company's profitability: the industry structure that imposes broad constraints on what a company can offer and charge and a competitive advantage that results from a strategy and a well-implemented value chain that lets a company outperform the average competitor in an industry over a sustained period of time. (Porter, 1985, p. 51)

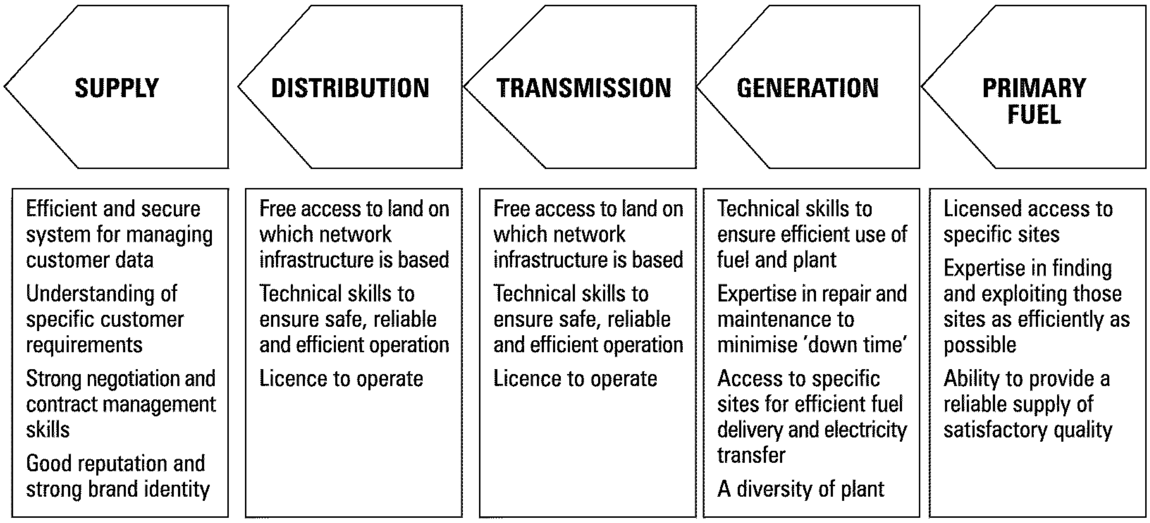
In conclusion, in Porter's books, companies that create and sustain competitive advantage do it because they have the discipline to choose a strategic position and then remain concentrated on it. They gradually refine their business processes and the fit of their activities so that their efficiencies are very hard for competitors to follow.

1.1.1. Current Electricity Value Chain

Energy industry has its own specific value chain, which is currently undergoing fundamental changes. In order to understand the nature of the issue and the opportunity, it is important to establish how the electricity value chain typically operates today (see Figure 05).

The flow along the electricity value chain starts with Energy Producers who mine and refine the fuels used in electricity productions including coal, gas, oil or nuclear based fuels. The production of the fuels is typically controlled by a control system that operates in real time within the confines of the fuel production facility. The fuels are then delivered to the generation facilities where they are converted to electricity through the generation process which is controlled by its real-time control system. The primary business communications between the generation company and the fuel producer is a bill that is sent from the business system of the fuel producer and paid via the business system of the electricity generator, typically monthly. The fluctuating cost of the fuel is reflected in the bill.

Figure 05: Traditional Electricity Value Chain



Source: Supply Chain Management: An International Journal, 1996

The Electricity Generator uses the fuel purchased from the Energy Producer to drive a generator to produce electricity and dispatch it to a Transmission and Distributions (T&D) system, which distributes the electricity to the consumer locations through a transmission and distribution grid. The real-time operations of the Electricity Generator are controlled by its local control system and the transmission and distribution of the electricity is typically controlled by a real-time Market Operator system. Depending on the location, the Electricity Generator and Transmission and Distribution can be part of the same company or managed by different companies. In the latter case, the primary business interaction between the Generator and T&D companies is a bill and payment interaction on a monthly basis. The price of T&D is regulated and common for all Generators in order to guarantee third-party access and transparency. (Invensys, 2011, p.3)

The Consumers consume the electricity from the T&D system and though the price of the electricity they are consuming is changing in fairly frequent intervals, this information is not typically accessed by the consumer and the consumption behaviors seldom reflect the dynamics on the grid. The payment for the T&D function is part of a complex settlement process with the Generating Companies in which the Generators pay a T&D charge and the Generating Companies bill the Consumers. It is fairly evident that current level of communications across the various nodes of the electricity value chain does not provide the frequency or type of information necessary to optimize the overall performance of the value chain.

The primary aspect of the operation of today's electricity value chain is the price of electricity directly reflects the demand/supply balance at the Generation Stations and across the grid. If consumers could consume the bulk of their electricity during the low cost periods and avoid using it during the high cost periods it would have a very positive balancing effect across the entire value chain. The Generators and Grid managers increased the cost during the high load periods because the cost of meeting the high loads is greater than that of base loads. Many consumers could, and perhaps would, adjust their consumption behaviors to the cost of the electricity to reduce their electric bills if they had the required information within the needed time frame to make the appropriate consumption decisions. Unfortunately, that information is not currently being transmitted – although it is clearly available. If consumers changed their behaviors according to the price of electricity, it would reduce the excursions over base load, helping both the generators and grid managers in the process. (Invensys, 2011, p.4)

The potential to optimize the operation of the electricity value chain exists today. In short, the energy value chain is not fixed, but subject to external and internal influences, which can result in vertical, horizontal and even lateral movements in this chain on the medium and longer term.

1.1.2. Future Electricity Value Chain

While the electricity infrastructure that underpinned much of the economic and social development of the 20th Century continues to perform its original functions well, there is widespread consensus that it must be fundamentally transformed in order to meet the needs of the 21st Century. The utilities and energy companies that build, maintain, and operate the world's electric power systems must respond to a number of critical challenges and opportunities, ranging from resource constraints and environmental strictures, to more proactive consumers and potentially disruptive technologies.

The assumptions that have defined traditional utility operations — mostly one-way flow of power and information, limited competition in distribution, declining costs from increased usage, cost-effective carbon-based generation, and undifferentiated, passive consumers — have been undergoing fundamental change for some time. Shifts in energy policy, technology, and consumer focus are transforming these assumptions, driven by concerns about energy security, environmental sustainability, and economic competitiveness. Meanwhile, against this backdrop of change, energy utilities are still held accountable for delivering reliable power while minimizing costs. (IBM, 2012, p.2)

In addition, consumers are becoming more engaged. The access to information and customized services that people have experienced in other industries, such as telecommunications and banking, are setting new expectations for the energy market. At the same time, the rise of technologies that spur more active consumer interplay with electric power systems — electric vehicles, smart meters, "dispatchable" peak load control (e.g. demand response), home energy services, and distributed solar generation — is changing the nature of customer interactions from primarily generic, one-way transactions to something more interactive and customized.

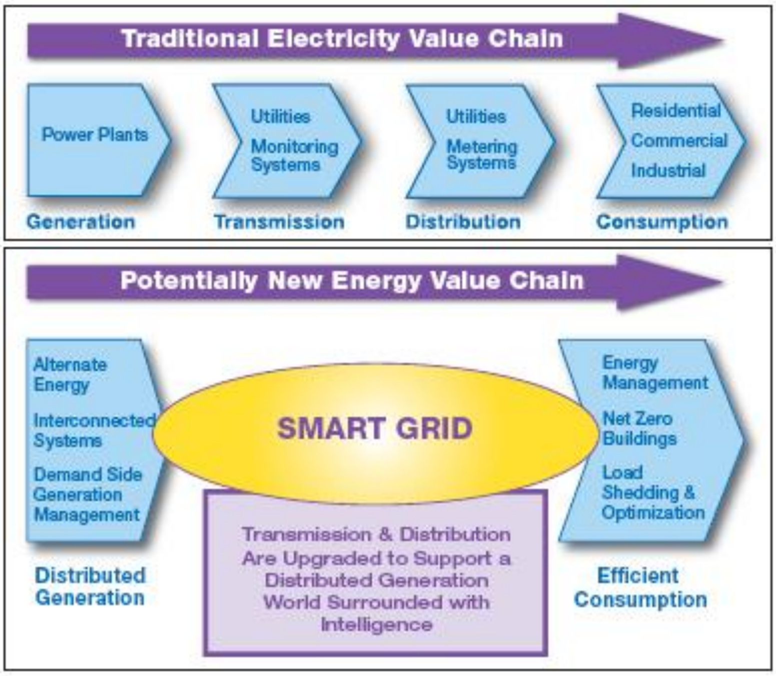
Growth of decentralized energy will force change on utilities' business models. Some of their most profitable customers will reduce their regular power consumption from the central grid in favor of locally produced power. These customers may still depend on the central grid for their emergency or peak use, so utilities will have to maintain their costly infrastructure and power-generating capabilities even as revenues from consumption decline. Furthermore, as customers produce more energy themselves and reduce their consumption through energy efficiency measures, the old pricing models will no longer be enough to pay for reliable grid infrastructure. (Bain & Company, 2013, p.3)

Energy and utility organizations around the world have recognized these dramatic changes, and many are taking action to address them. They are making investments to upgrade the capabilities of the grid and to enable consumers to take a more active role in managing their energy use via smart meters, connected appliances, and web portals.

Utilities are installing technologies that improve the efficiency of the grid, and developing new capabilities for integrating renewable energy into the grid. And they will soon install equipment for storing energy, so power can be made available when it is needed, rather than simply when it is produced. (IBM, 2012, p.3)

Much of the public discussion about transforming the electrical system has focused on the idea of smart grids - an integrated, scalable system that extends from businesses and homes, through the distribution and transmission systems, back to the sources of energy (see Figure 06). A smarter energy system is instrumented, with sensors and controls embedded into the fabric of its operations; it is interconnected, enabling the two-way flow of information — including pricing — and energy across the network; and it is intelligent, using analytics and automation to turn data into insights and to manage resources more efficiently.

Figure 06: Potentially new Electricity Value Chain



Source: todaysfacilitymanager.com

For most energy and utility companies, success of developing smarter systems that address the challenges and opportunities facing the industry will be achieved through three key imperatives: transforming the utility network, improving generation performance, and transforming customer operations. The resulting smarter energy systems will help save tens of billions of dollars in operating costs and reduce the need to build more capacity; anticipate detect, and respond to problems quickly; empower consumers; and help integrate electric vehicles and energy from renewable sources. (IBM, 2012, p.3)

Summary

Value chains are important part of any business strategy, since they are a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. Especially the energy market is specific by its huge corporations with many subsidies often operating along the whole electricity value chain – fuel, generation, transmission, distribution, and supply – either in regulated or liberalized markets (or mixture of both). This traditional business model based on mainly one-way flow of information and power is however changing. Mainly due to more proactive consumers and decentralized generation, it is transforming into a new business model based on many smaller actors and multiple-way flow of information and power all interconnected via smart grids.

2. METHODOLOGY

The topic and the aim of research affect the method or the combination of methods researcher chooses for conducting the research (Johnson & Duberley, 2000). Methodology chapter thus outlines the philosophical and methodological assumptions that underline the thesis, as well as describes what methods and techniques were used to obtain all the necessary data during the research. The chapter illustrates the whole process of doing the research from designing the research to analyzing results and reporting them. In order to reach the goal of my research, qualitative analysis constitutes a major tool for collecting and analyzing data. The chapter ends with consideration of validity, reliability and a brief summary.

The success of the research depends on the clearness of problem statement and on the appropriate methods used to handle this problem. However, according to research literature, management research is multi-stage process that researcher must follow to provide a complete research. So it is necessary to carefully prepare a plan to follow during the research project. For that purpose research process plan was developed, consisting of research design, data collection, data analysis, and quality of research. These research plan steps thus explain decisions on methodological approaches for this project work.

2.1. Research Paradigm

While reviewing the relevant literature, it is also necessary to understand general philosophical issues and to define philosophical position. This helps to clarify the research design. There are two major epistemological approaches to the social science research: positivism and social constructionism. This research lies within the social constructionism paradigm, since this approach “focuses on the ways that people make sense of the world, through sharing experience with others via the medium of language” (Easterby-Smith, 2012, p.23). The main premise of this paradigm consist in the idea that “reality is determined by people rather than by objective and external factors and researcher should appreciate the different constructions and meanings that people place upon their experience” (Easterby-Smith, 2012, p.23).

There are several implications of the social constructionism (Easterby-Smith, 2008):

- The observer is a part of what is being observed
- Human interests are the main drivers of the science
- Explanations aim to increase general understanding of the situation
- Research progresses through gathering rich data from which ideas are induced
- Concepts should incorporate stakeholder perspectives
- Units of analysis may include the complexity of ‘whole’ situations
- Generalization through theoretical abstractions
- Sampling requires small number of cases chosen for specific reasons

This research lies within main premise and implications of social constructionism. This approach could also be referred to as one of the interpretative research methods (Easterby-Smith, 2012). Thus, it could be argued, that within such approach main attention is centered on people’s personal perception, their thoughts and interpretations.

2.2. Research Design

Constructionist research designs are linked to the relativist and nominalist ontologies. Research designs are about organizing research activity, including data collection, in ways that are most likely to achieve the research aims (Easterby-Smith, 2012, p.37).

There are three different types of research design: explorative, descriptive and causal. This research design is explorative with descriptive elements. In the case of this research, exploratory study is useful because it is a valuable means of finding out “what is happening; to seek new insights; to ask questions and to assess phenomena in a new light”. It is particularly useful in clarifying understanding of a problem. Explorative design includes interviewing experts and search of the literature in the subject (Gummesson, 2000). Another type of research design used is descriptive research, which describes data and characteristics about the phenomenon being studied. Descriptive research answers the questions who, what, where, when and how (Easterby-Smith, 2012).

This research is based on a single case study. Case study is “a strategy for doing research, which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence” (Easterby-Smith, 2012, p.54). Firstly, constructionist studies are based on direct observation and personal contacts, generally through interviews (such as this research). Secondly, they take place within single organizations, but then involve sampling from numbers of individuals. Thirdly, the collection of data takes place over a period of time and may include both live observations and retrospective accounts of what has happened. Thus, unit of analyses in the constructionist studies involves in-depth examination of either the individual or specific organizations or events, instead of using large samples (Easterby-Smith, 2012, p.56).

2.3. Data Collection

This research is based on the qualitative research method, which is an understanding process through investigation based on distinct methodological traditions of inquiry that explore a social or human problem. Qualitative techniques allow collecting data, which is based on meanings and expressed through words. There are three approaches of data collection in qualitative research: in-depth and open-ended interviews, direct observations and interactions, and written documents. (Easterby-Smith, 2012, p.126)

Because of financial limitations and lack of time, after careful analysis of all possible alternatives, the research was conducted via interviews, since, as mentioned before, this type of research is within social constructivists’ paradigm, where facts depend on viewpoint of observer. Nevertheless, even thought this type of data collection method is often claimed to be the best method of gathering information, its complexity can be sometimes underestimated and requires serious preparation in advance.

Qualitative interviewing is based on conversation, with the emphasis on researchers asking questions and listening, and respondents answering. There are three different types of the interviews: structured (highly), semi-structured and unstructured (in-depth) (Easterby-Smith, 2012, p.128). This research uses semi-structured type of qualitative research interviews, since they allow exploring a specific area in which you are interested.

Researcher needs a framework from which to plot out developing themes, however, researcher is not tied up by them (Easterby-Smith, 2012, p.127).

In order to collect primary data for the research, four interviews were conducted with three representatives from CEZ Group and one representative from Czech Ministry of Industry and Trade:

- Vladimir Hlavinka (former CEZ Board of Director Member)
- Petr Mikovec (CEZ Business Development Director)
- Petr Stulc (CEZ Asset Management Director)
- Josef Snitily (MIT, Department of Electricity Industry)

These interviews allowed me to get to know CEZ first hand, outside the annual report official statements, and to learn about its current difficulties and strategies to deal with them. Representatives are responsible for various departments. All of them have different length of service, but significant managerial experience in CEZ Group. The forth interview allowed me to learn about current and future instruments in the regulation sphere of this industry.

It was quite difficult to find experienced managers, who would be willing to speak about such a current topic. I was very fortunate to have a contact person in CEZ Group, who helped me to find and contact all the interviewees within the company. After discussing the research topic with him, he came up with a list of employees whom it would be appropriate to interview. Since the topic of the research is focused on strategic decision making, I was focusing on people who represent top management, but from different divisions within CEZ Group, who have different perspectives on the presented problem. One representative of Czech Ministry of Industry and Trade was also approached to see the governmental side of the problem. To obtain this interview wasn't that difficult, since I have a prior internship experience there.

Considering that all of the respondents are very busy people, duration of one interview took on average 30 minutes. Interviews were conducted in Czech language. For interview guide, used during the interviews, see Appendix 2.

The main secondary data used for writing this thesis has been collected from the available literature, statistics, and in particular the existing reports and documents of the various consulting companies. Given the topicality of the researched problem, I also analyzed articles, official websites and presentations, annual reports and various international news sites (mainly The Economist). To learn about the current changes, it was mainly the World Energy Outlook 2013. For the European Union part, it was its Europa website portal. For the Central European and Czech Markets, it was the Annual report of Czech market operator OTE. One of the most important sources of secondary data was also the PwC Annual Global Power & Utilities Survey, which provided the research about European Energy companies and their future perspectives of the market. The readings were both in English and Czech languages.

2.4. Data Analysis

It is essential for the research to understand the received data and to interpret them correctly. Hermeneutics, classical theory of text interpretation, is valuable tool for the purpose of understanding texts by underlying meaning of collected data (Easterby-Smith, 2012, p.31). Understanding constitutes a "creative, re-productive act, in which the researcher appropriates the meaning of the object, rather than mechanically mirroring it" (Alvesson and Skoldberg, 2000, p. 68). In order to increase the possibility of understanding the meaning of the texts, interviews were with the respondents permission recorded. Afterwards, each interview was transcribed and main quotas given by the respondents were presented.

In order to gain a deeper and richer meaning behind the researched data from interviews, hermeneutic circle technique, that mostly supports qualitative research in understanding, treating and interpreting received information, was used (Alvesson and Skoldberg, 2000). Thus, the semi-structured interview guide prepared for the interview was flexibly adjusted with the every interview acquired from one participant to another. Received information from the first interview assisted in gaining some general insight into what drivers are causing the fundamental changes in European Energy Sector Second and what implications it is causing to the company. Hermeneutic circle was formed of other two interviews, with representatives from different departments. They were aimed at receiving personal opinion on the strategic (value chain) and asset base (structure) implications of current changes. The last interview with ministry representative then offered a specific insight into state position.

The biggest challenge after collecting all the necessary data was, however, to structure all received information in a logical manner, interpret and analyze them. My initial knowledge developed and transformed during the data collection and analysis process.

2.5. Quality of research

It is not easy to estimate the level of quality in research design such as explorative research and case studies. There are a lot of aspects to consider, but the two main criteria are validity and reliability, which in great extent depend on methodological skills, sensitivity and integrity of researcher. However, it is very important to assure high level of validity and reliability of the research. Otherwise, the research would be useless, if the collected data would not be accurate or not relevant for the topic.

Reliability refers to the extent to which data collection techniques or analysis procedures will yield similar observations by other observers (Easterby-Smith, 2012, p.71). Hence, the researcher must be sure that needed information will be reliable. Therefore, respondents from various company departments that are directly involved with dealing of the current changes were personally interviewed, in order to create a reliable research. At the same time, all respondents have a decision power to influence future developments, and that is why the research is concentrated on their opinions.

Since the interviews were on one-on-one basis and the first respondent was known before, the engagement in an exploratory discussion was not a problem. In case of the other three respondents, they had no trouble answering the questions and provide additional and relevant information. The difficulty in taking notes during interview was eliminated by voice recording. Also, in order to eliminate misunderstandings and thus affect reliability, interviews were transcribed after their recording and sent back to respondents for approval and relevant corrections.

Validity refers to whether a research is able to scientifically answer the question it is indented to answer while having a sufficient number of perspectives included (Easterby-

Smith, 2012, p.71). This is why the data is collected from very competent people - top managers and directors, who have the development insight to the strategic changes in the company.

The social constructivist's designs demonstrate the quality of research by three criteria for estimating the validity level: authenticity, plausibility and criticality (Easterby-Smith, 2012, p.53). Authenticity involves convincing the reader that the researcher has a deep understanding of what was taking place in the organization. This research presented sufficient amount of information concerning the fundamental changes and instruments used while providing a wide spectrum of details about the company. Plausibility requires the research to link into some ongoing concern/interest among other researchers. This criterion was achieved by connecting the research to value chain management theory, and explicitly its changes in the electricity industry. Criticality encourages readers to question their taken-for-granted assumptions, and thus offer something genuinely novel. This research adds to the theory knowledge about the future electricity value chain developments concerning a specific country. Very important part also plays the transparency of the whole research process.

In order to provide accurate reflection of reality, there is a distinction between internal validity and external validity (Easterby-Smith, 2012, p.45). Internal validity is focusing on whether or not what has been identified as the cause actually produces the effect, and is an important measure in quantitative researcher and therefore not assed here. External validity is concerned about the generalizability of results beyond the immediate research sample. This research is concentrated on one of the biggest European Energy Companies with similar value chain characteristics as the others.

Factors that could affect the validity of research include, above all, the right interpretation of the received information from the respondents. This proved to be very challenging, considering that English is not my native language. Since interviews are data collection through language and words, it is very easy to misunderstand or misinterpret them, especially if they in the foreign language. Therefore, it was very important to translate from Czech to English and to interpret English information correctly, since words can take on different meanings in different contexts.

Summary

The research is based on philosophical position defined as social constructivism. Research design can be described as explorative with descriptive elements, where research results are represented in a single case study. In order to get a broader understanding of the research question, both primary and secondary data were used. Interview as a qualitative method was an important source for the research data collection. Totally, four semi-structured interviews with respondents from the company and state sphere were reported. To ensure the quality of research by providing reliable research with high level of validity, different techniques were used. Data was obtained from very experienced managers of various departments of one of the biggest European energy companies. Analysis, interpretation and reporting of the findings were achieved through logical connection of received empirical findings and elaborated theory.

3. EMPIRICAL FINDINGS

In order to find out how fundamental changes on European energy sector are implicating on value chain and structure of the Czech electricity company, one case study is presented.

The chapter is structured in the following way: First part focuses on the description of the changes by identifying its drivers (commodity prices, RES support and decentralized generation), implications for electricity systems, markets and energy companies, and reasons for transformation of the business model. The second part deals with the European level by describing the European energy policy and legislation. It describes the various current tools (liberalization, integration, EU ETS, RES subsidies) used to secure the single energy policy, as well as the future ones (especially capacity mechanisms). The third part then identifies the specifics of the Central European and Czech electricity markets. The final forth part analyses CEZ Group by describing its assets and value chain, financial performance, strategy and concrete steps in dealing with the changes.

Empirical findings described in this part of the research are summarized in each section of this chapter.

3.1. Description of current changes

The last four years (2010 - 2013) have seen significant developments in a number of electricity markets around the world. For example, in the United States, exceptionally low gas prices in 2012 led to a strong surge in gas-fired electricity generation, displacing coal-fired generation. The opposite was true in the European Union: as natural gas became increasingly expensive, compared to coal, this – in combination with low CO2 prices, weaker economic activity, lower electricity demand and continued expansion of renewable based capacity – led to a noticeable drop in gas-fired generation in 2012 compared to the previous year. Europe has also seen continued strong growth of variable renewables that have increasingly impacted the operation of conventional power plants and lowered wholesale power prices in some markets. (WEO, 2013, p.170)

3.1.1. Triggers of current changes

The triggers of the current changes started to occur during the first decade of the 21st century, but its influence appeared only at the beginning of the second. Many European utilities argue that it is mainly the vast deployment of renewables that undermine established utilities and replace them with something less reliable and much more expensive. However, there is more than one factor influencing current changes and its proportion is because all of the factors combined hit the market in a very short period.

The decline of Europe’s utilities came as a surprise. At their peak in 2008, the market cap of top 20 energy utilities was roughly 1 trillion Euros. Today they are worth less than half of that amount. Since 2008, utilities have become the worst-performing sector in the Morgan Stanley index of global share prices. In 2008, the top 10 European utilities all received credit ratings of A or better, today only five do. (Thomas Reuters, 2013)

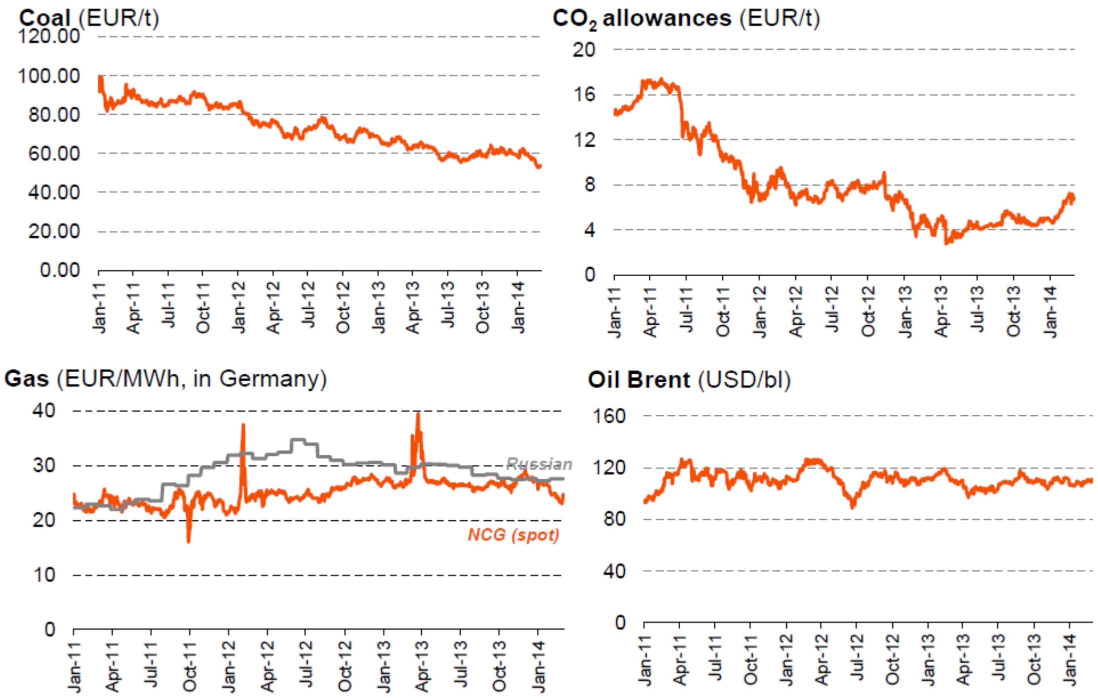
The fact is that utilities would have been in trouble anyway, even if renewables did not happen. It all started during the 2000s, when European utilities overinvested in generation from fossil fuels, boosting the capacity by 16% in Europe as a whole. However, the electricity market did not grow so fast; especially since many energy efficient measures were introduced by the various EU environment initiatives. Then in 2008, the financial crisis hit demand, decreasing it even more. (The Economist, 2013, p.22) According to the International Energy Agency, total energy demand in Europe will continue to decline by 2% between 2010 and 2015.

Commodity prices

Another two influences from outside Europe later added to the problems. The first happened in 2011 and it was the Fukushima nuclear disaster. This accident, followed by major anti-nuclear protests, forced the German government into the immediate closure of eight nuclear-power plants and a gradual phase-out of the remaining nine by 2022. Even that many of the plants were scheduled for closure anyway, such a sudden change on the electricity market made the situation for utilities worse.

The second influence was the shale-gas revolution in the United States. The cheap gas made the coal burning in America unnecessary, pushing it to Europe, where its surplus shifted coal prices down relative to gas prices. At the same time, carbon prices crashed since there were too many permits to emit carbon in Europe's emissions-trading system and the recession cut demand for them. See Figure 07 for commodity price details.

Figure 07: Development of prices of main input commodities in Europe



Source: CEZ Group, 2014

Low carbon prices thus reduced the penalties for burning coal, and together with cheap fuel kept margins at coal-fired power plants profitable. On the other side, expensive gas considerably reduced margins for gas-fired plants and made them the most expensive sources of electricity generation. This resulted in suspension of around 30GW of gas-fired capacity in Europe since the peak in 2008, including brand-new plants (e.g. Pocerady gas-fired power plant in the Czech Republic). On the contrary to what was supposed to happen according to European intentions, the increase in coal-burning pushed carbon emissions up in 2012-13. (The Economist, 2013, p.23)

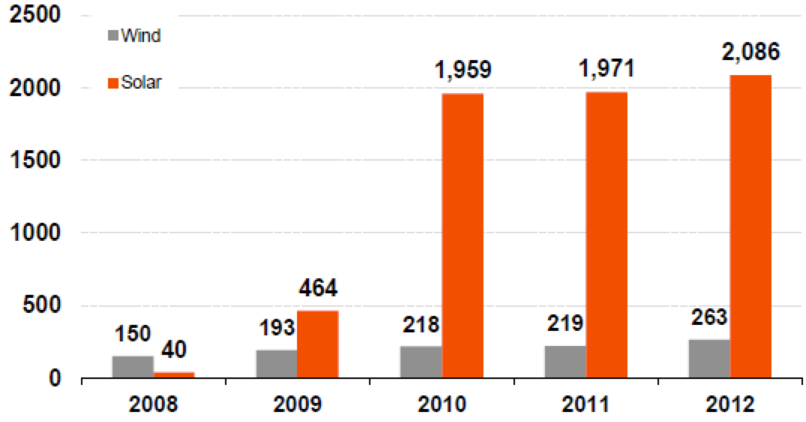
This means that the nuclear and gas parts of energy business in Europe were heading for trouble even before the boom of renewables. Therefore, the first important trigger of the current changes is the situation on the market of main input commodities.

RES support and subsidy

Rapid expansion of renewable power generation, particularly wind and solar, has occurred in recent years (2010-2013). This expansion was particularly driven by the requirements of the EU's Renewable Energy Directives and national targets. However, slow growth of power demand and a difficult economic situation raise doubts about the timing of future investments. Some policymakers have started to express concerns about the affordability of high shares of certain types of RES generation. These concerns relate mainly to higher than anticipated rates of deployment of solar photovoltaic (PV) systems, driven, in some countries (such as Germany or the Czech Republic), by generous and unlimited subsidy schemes and rapidly falling PV system cost. (WEO, 2013, p.198)

The installed capacity of solar power generation solely in Germany increased by 7,6GW in 2012 and by 3,3GW in 2013. The Czech Republic has seen increase by 2GW between 2010 and 2013 (see Figure 08), increasing the share of RES to almost 12%. Subsidies for renewable energy are running at €16 billion a year in Germany; €0,5 billion a year in the Czech Republic; the cumulative cost for EU is around €60 billion and rising. (EPIA, 2013)

Figure 08: Installed capacity of WPP and PV in the Czech Republic (MWe)



Source: ERU, 2012

Unlike dispatchable power plants, which may be turned up or down to match demand, the output from solar and wind power is tied to the availability of the resource. Since their availability varies over time, they are often referred to as variable or intermittent sources, to distinguish them from the dispatchable or conventional power plants (fossil fuel-fired, hydropower with reservoir storage, geothermal and bioenergy). (WEO, 2013, p.208)

The problem is that nuclear or brown coal-fired power plants are designed to run full capacity and cannot easily reduce generation. At the same time, the extra energy from solar or wind power is free. So the burden of adjustment falls on the flexible gas-fired and hard-coal power plants, whose output decreased to only about 10% of capacity. Therefore, utilities are losing money on electricity generation, since they cannot fully use their conventional power plants. They also worry that the RES growth is destabilizing the grid, and may lead to blackouts or brownouts. (The Economist, 2013, p.22)

Another major trigger of the current situation is therefore the renewable boom caused by its vast governmental support. Total capacity, including renewables, is way above peak demand and mightily causes oversupply. Excess supply plus depressed demand equals very low wholesale electricity prices. Prices decrease or go negative to encourage cutbacks and protect the grid from overloading. For established utilities, this is a disaster.

Decentralized generation

However, renewables don't just put pressure on margins. They are transforming the established business model for utilities, since they are offering the possibility of decentralized generation, where energy is produced close to where it will be used, rather than at a large plant elsewhere and sent through the national grid.

This local generation reduces transmission losses and lowers carbon emissions. Since customers don't have to share a supply or rely on relatively few, large and remote power stations, security of supply is increased nationally. There can be economic benefits too. Long term decentralized energy can offer more competitive prices than traditional energy. While initial installation costs may be higher, a special decentralized energy tariff creates more stable pricing. (WEO, 2013, p.189)

Nevertheless, difficulties about integrating high levels of decentralized RES into the electricity system are also emerging and causing problems in some European countries. On a technical level, the intermittent nature of distributed generation increases the difficulty of physically balancing the system and ensuring adequate power supply. On a revenue level, managing extra challenges pushes more costs back onto the system.

"Today, a variety of disruptive technologies are emerging that may compete with utility-provided services. Such technologies include solar photovoltaics, battery storage, fuel cells, geothermal energy systems, wind, micro turbines, and electric vehicle enhanced storage. As the cost curve for these technologies improves, they could directly threaten the centralized utility model." (PwC, 2013, p.8) Therefore, the third trigger of current changes is the advent of decentralized generation.

There is also another general element connected to all of current changes. It is a new type of active and aware consumers brought mainly by expanding RES and decentralized generation. The so called "prosumers" are a new era of more engaged "energy-saving" and increasingly "energy generating" customers, who on one hand cause decline in revenues, but on the other hand represent a new opportunity for the companies. The more large numbers of current consumers turn into future prosumers, the more enormous and disruptive are the potential impacts for current market model (especially with decreasing technology cost that doesn't need subsidy and improving battery capacity that doesn't require selling to the grid). (PwC, 2013, p.18)

3.1.2. Implications of current changes

Current changes on the energy market bring many subsequent implications for the electricity systems (electricity grids and dispatchable power plants), electricity markets (market price formation) and energy companies (falling value and investment role).

Implications for electricity systems

The extent of impact of a growing component of variable renewables on the power system depends on the timing and coordination of new RES capacity additions, the investment cycles in the power system, and the rate of deployment of measures to facilitate their integration into the system. RES location and modularity mainly impact the transmission and distribution network (electricity grid), while RES variability and uncertainty impact the way other power plants in the mix are operated (mainly dispatchable plants).

Electricity grids

The location of effective variable renewable sources can be remote from demand centers, making transmission grid extensions necessary. Early and integrated planning of transmission corridors is necessary to maximize use of RES and reduce public opposition.

In some locations, transmission corridors have to cross state or national borders, requiring cooperation between transmission system operators and regulators.

The transmission system costs involved to connect and integrate variable renewables depend on the distance to be covered, the status of development of the existing grids and the amount of capacity of variable renewables to be integrated. Costs range between $100 and $250 per kW of added variable renewables capacity. In Europe, high levels of deployment mean that the integration of renewables accounts for a share of overall transmission investment of about 25%. (WEO, 2013, p.212)

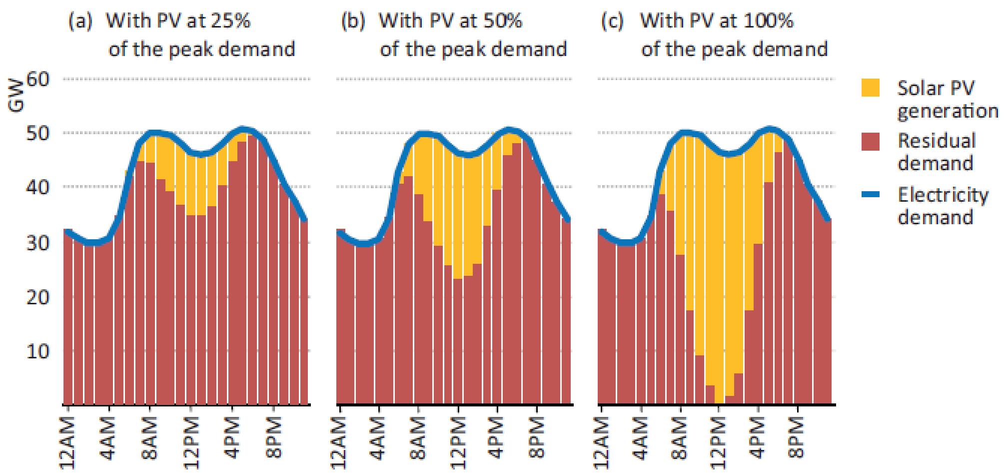
The modularity of variable renewables can also have significant impacts on distribution grid needs. Bypassing the high-voltage transmission grids that transport power from large conventional power plants, wind and solar generators are typically connected at the distribution level (wind at mid-voltage and solar mainly at low-voltage). At low levels of installed wind and solar capacity, their generation can be consumed close to the production site (especially for solar PV) and may reduce the strain on distribution grids. At higher levels, the capacity of the distribution grid may need to be raised to accommodate increasing volumes of electricity sold back to the grid by distributed generators. Voltage transformers can be an initial bottleneck; a need to upgrade line capacities may follow.

The amount of investment to upgrade distribution grids also depends on their current condition. If these grids are in need of refurbishment, the additional costs may be low. For example, in France and Germany, each kilowatt of new variable renewables capacity will add an estimated $100 to $300 to the costs of the distribution grids. (WEO, 2013, p.213)

Dispatchable power plants

In the absence of a widespread uptake of the measures available to reduce the challenges posed by variables renewables (such as adapting the operation of power systems, extending the transmission grid, promoting demand-side integration, investing in storage, balancing fluctuations from variable renewable output with flexible forms of generation, or curtailing extreme wind and solar power), an increase in generation from wind and solar power has implications for the operation and use of dispatchable plants as well as for investment in such plants.

Figure 09: Indicative hourly electricity demand and residual electricity demand with expanding deployment of solar PV



Source: WEO, 2013, p.214

Electricity demand varies considerably during the course of a day, but it generally follows a predictable profile. For example, on a weekday demand may peak in the early evening as people arrive home and be lowest during the early hours of the morning when most people are asleep. However, wind and solar generation is tied to the availability of their resources and is often not well matched with the electricity demand profile. The pattern of the remaining electricity demand, after variable renewables production has been taken into account, also called residual electricity demand, can differ markedly from the total electricity demand (see Figure 09).

The variability of wind and solar generation alters the peaks and troughs in the residual demand profile which requires the dispatchable plants to adjust their output level accordingly. However, where variable renewables generation is well correlated with electricity demand (e.g. solar PV coinciding with air conditioning loads at midday) their generation pattern – up to a certain level of deployment – may be advantageous to the system by smoothing the demand profile. (WEO, 2013, p. 214)

The greater the variability of residual demand, the greater the flexibility of dispatchable power plants must be to be able to respond to changes not only of demand but also to supply side changes. This can raise their operational costs (through not running at optimal efficiency) and increase the wear-and-tear of power plant components. These "balancing costs" vary from system to system, depending on the presence of storage, the flexibility of the power plant fleet and also the quality of wind and solar resources and forecasts.

In Europe, where the electricity generation of variable renewables increases faster than demand, utilization of existing power plants is reduced considerably. However, despite the increasing capacity of wind and solar, their variable and uncertain generation profile means that the need for dispatchable capacity is not reduced significantly. The reason is that the share of installed RES capacity that can be confidently relied upon at times of high demand is much lower than for dispatchable plants. Thus many of the existing dispatchable plants will continue to be needed, but will likely to experience less use. (WEO, 2013, p. 214)

The most flexible and efficient dispatchable power plants that can balance the intermittent RES generation are gas-fired ones. Today in Europe, the trouble is that they have very high operational cost due to high natural gas prices (which at the same time are higher than wholesale electricity price). This means they are highly unprofitable for the companies to operate, and therefore are being shut down or used as a back-up capacity. Anyways, they are needed and the current financial situation without any support mechanisms threatens future investments into such dispatchable generation.

Implications for electricity markets

<u>Market price formation</u>

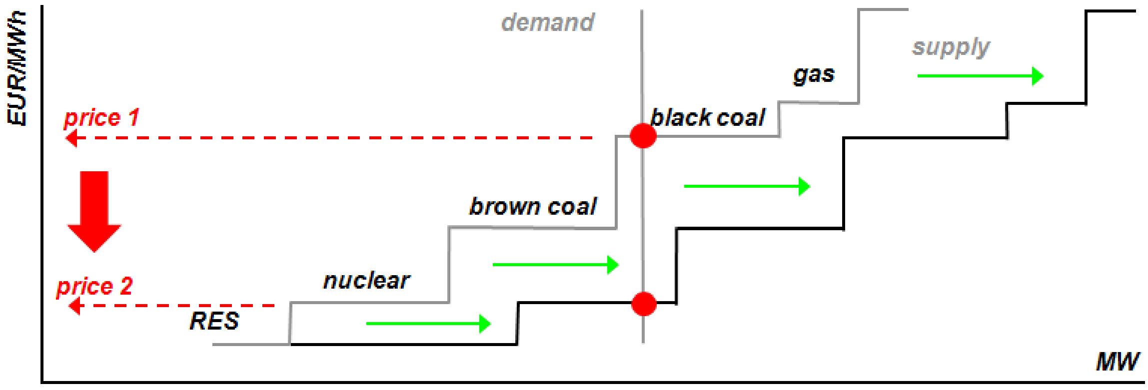
In most liberalized electricity markets, spot wholesale prices are largely determined by the operational costs of the most expensive generating unit used. Whenever low marginal cost power from wind and solar is added to the system, generators with high operating costs, at the upper end of the merit order,[1] are needed less and the wholesale electricity price is, in consequence, lowered. Electricity end-users might benefit from this decrease depending on how much of the cost subsidies to renewables is passed through to them.

The merit order effect may also reduce profit margins for all power generators, to the point that some generators become unprofitable (see Figure 10). This has been observed recently, for example, in some European markets, and has put in question whether some

[1] The merit order ranks the different generating units that are available in a power market in terms of their marginal cost of generation. It is often used to determine which units will be used to supply expected demand, with the cheapest units being used first.

utilities will be able to recover the investment costs of dispatchable plants under current market conditions. This could potentially jeopardize the reliability of power supply if the situation worsens. (WEO, 2013, p.216)

Figure 10: The impact of the increase of additional RES generation on electricity prices (even within a few hours)



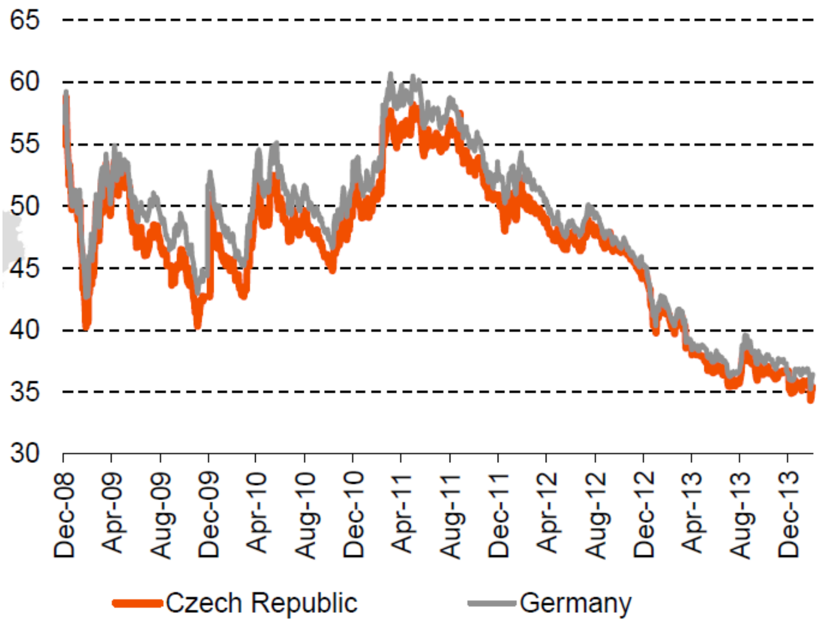
Source: CEZ Group, 2014, s.5

Market reforms have been introduced or are under consideration in several countries where there is concern that price signals resulting from this effect may not be sufficient to stimulate timely and sufficient investment in new dispatchable power plants or to maintain older plants in operation. The options include different forms of capacity remuneration or regulatory obligation to maintain strategic reserve capacity or to allow hourly wholesale prices to increase unconstrained during times of scarcity (for example, when peak demand periods coincide with limited generation from variable renewables). Discussion of these issues remains open. One possibility is to incorporate measures which can reduce capacity needs, such as storage or demand-side management.

Electricity prices

Since European electricity markets are liberalized, and the price is also determined by trading electricity on the EEX energy exchange, it means that excess supply plus depressed demand equals lower wholesale prices. Wholesale electricity prices have fallen from over €80 per MWh in Germany in 2008 to just €38 per MWh in 2013, and are still continually decreasing (see Figure 11). As wholesale prices fall, so does the profitability of power plants. Bloomberg New Energy Finance supposes that 30-40% of RWE's conventional power stations are losing money. (The Economist, 2013, p.23)

Figure 11: Historical development of wholesale price of electricity (year-ahead baseload, €/MWh)



Source: CEZ Group, 2014

End-user electricity prices are determined by the underlying costs of supplying electricity – including the cost of generating electricity (cost of fuels and cost of CO2), transmitting and distributing it through the network, and selling it to the final customer – and by any taxes or subsidies applied by governments to electricity sales. In many countries, the costs of subsidies to renewables energy are also passed on to the consumers through the electricity price (including Germany and the Czech Republic). The resulting price of electricity supply for final customers is thus composed of the regulated charges and the unregulated price of energy, which accounts for 40 to 60 percent of the resulting price depending on the voltage level and the nature of load.

Residential electricity prices have therefore increased in 2013 to €285 per MWh in Germany, some of the highest in the world, partly because they include subsidies for renewables that are one-and-a half times, per unit of energy, the power price itself. Similarly, industry electricity prices are under the same influence and are increasing as well. (The Economist, 2013, p.23)

Differences in wholesale electricity prices are a primary driver of differences in end user electricity prices between regions, although subsidies, taxes, grid costs and support mechanisms can have a significant influence. In the United States, wholesale prices are projected to be among the lowest in the world, having fallen in recent years. This expectation stems mainly from cheaper gas from abundant domestic shale gas supplies, which reduce fuel costs and investment costs, as gas-fired plants have one of the lowest capital costs. Wholesale prices in the European Union are projected to be 75% higher than in the United States in 2035. Strong deployment of wind and solar PV lowers fuel costs in the European Union, but raises operation and maintenance (O&M) costs and investment costs. Slowly rising gas prices – gas-fired generation maintaining a share of around 20% of the mix throughout the projection period – and increasing CO2 costs also drive up European Union wholesale prices over time. (WEO, 2013, p. 193)

European Union industry prices increase by 24% during the period and, by 2035, are the highest in major industrialized countries and roughly twice the level of those in the United States. As industry prices increase, so do the European production companies lose their competitive advantage compared to the United States. (WEO, 2013, p. 195)

Implications for energy companies

Falling value

In the last five years, utilities have sustained vast losses in asset valuation. Their market capitalization has fallen over €500 billion. That is more than European bank shares lost in the same period. These losses, many of which predate the boom in renewable energy, have different implications. For investors, they represent lost capital and lower future earnings. For employees, they turn into lower wages and lost jobs. Altogether, these losses have added to the huge sums Europe has also spent on climate-change policies (mainly subsidies).

At the same time, utilities are losing their investment role. Once they were steady, reliable and inflation resistant companies (like the U.S. Treasuries of the equity market). Investors and especially pension funds need such assets to balance their long-term liabilities. However, as evinced not just by collapsing share prices but also by dividend policies, utilities no longer play this role. Until 2008 the yields of RWE and E.ON followed German ten-year bonds. Since then, they have decreased to around 10%, while government-bond yields have stayed unchanged. (The Economist, 2013, p.24)

Above all, the decline in utilities' wealth makes the future of Europe's electricity system uncertain. European countries are slowly building a system in which there will be more low-carbon and intermittent energy sources, more energy suppliers, more modern power stations (replacing coal and nuclear plants), more and better storage, and more energy traded across borders. All this will be supported by "smart grids", which tell consumers how much power they are using, shut off appliances when not needed and manage demand more efficiently.

In such future electricity system, the traditional utilities play two vital roles. They will be back up electricity generators, ensuring the lights stay on when wind is not blowing and sun is not shining. And they will be providers of investment to help build the new grid. However, utilities' current situation makes it unclear whether they are in good enough shape to play either of these roles. (The Economist, 2013, p.24)

Nevertheless, until now, they have managed to provide backup capacity and the grid has not failed, even in RES developed Germany. But as the price fluctuations in Germany illustrate, it is getting harder to maintain grid stability. The problem is that utilities are not rewarded for balancing the variable nature of RES. And therefore, they are slowly shifting out of electricity generation to more profitable areas of electricity value chain. Almost everyone in the business admits that as the share of renewable energy rapidly increases each year, regulation of the grid needs to change.

<u>Provider of investment</u>

The role of utilities as investors is also being at stake. The total investment required to upgrade the grid is huge, as much as €1 trillion in Europe by 2020. Energy companies worth €500 billion cannot afford to finance such amounts. Instead, they are cutting capital spending or even stopping any new investment projects. For example, RWE's capital spending has fallen from €6.4 billion to €5 billion since 2011, and is expected to fall to €2.6 billion by 2015. Of that, €1.6 billion will go on maintenance, leaving just €1 billion for new development spending, only half of present levels. (The Economist, 2013, p.24)

In such situation, utilities cannot finance Europe's new clean energy system. And that has implications for the future. After all, energy sector and its security is one of the state's strategic goals. To make up for lack of investment by utilities, governments will have to persuade others to step in, such as pension funds or sovereign wealth funds. But these entities have always invested in energy indirectly, by holding stakes in utilities, not directly. Transformation of current system is therefore needed.

3.1.3. Transformation of business model

The prospect of transformation of the electricity business model arises from a number of potentially disruptive changes mentioned in the previous chapter. However, the extent of current disruption to the business model is perhaps only now becoming clear. Where it will lead and what it will mean for the future utilities' business model remains unknown. Current power utility business model is deeply entrenched and the geopolitical context of the industry means that the environment for change is less dynamic than sectors more exposed to pure market forces. Nevertheless, Europe is where the current environment for power utilities is proving most disruptive, and therefore the anticipation of transformation is widely felt.

According to the PwC 13^{th} Annual Global Power & Utilities Survey, many in the industry expect the existing utility business model in their market to transform or even be unrecognizable in the period between now and 2030. 94% predict complete transformation or important changes to the power utility business model. Only 20% of survey participants in Europe expect centralized generation and transmission to play the lead role in meeting the future demand growth.

Providing electricity used to be a relatively simple affair thirty years ago. Utilities guaranteed a constant supply of power by building plants that ran on coal, nuclear energy (if they wanted it) or hydropower (if they had it). They ran these plants full blast all day long (for technical reasons), and that provided "baseload power" or the amount always needed. They also had plants that could more easily be powered up and down, such as gas-fired ones, to supply extra electricity at peak times (middle of the day or early evening). The chart of power provision during the day then looks like a layer of cake: the bottom layers are flat (nuclear, coal and so forth); the layer at the top (gas) is wavy.

Deregulation during the 90's changed this ordered system, allowing power plants produce according to the marginal cost of electricity. The advent of renewable energy then accelerated the changes, since they have "grid priority". This is a legal requirement to encourage renewable energy, meaning the grid must take their electricity first. But there is also logic in why grids would take their power first anyway - because the marginal cost of wind and solar power is zero. This means that RES cuts in the chart of power provision during the day to the bottom of the layer cake. But in contrast to the baseload providers already running (nuclear and coal), solar and wind power are surging depending on weather. This intermittent feature of RES makes the bottom layers of the cake wavy, too.

Nowadays, when demand fluctuates, it may not be sufficient to lower the output of gas-fired units. Some plants may have to be fully switched off and some coal-fired ones turned down. This process is costly since scaling back coal-fired plants is difficult. It makes electricity prices more volatile and is having a devastating effect on profits.

Under the old system, electricity prices spiked during peak hours, falling at night as demand dropped. Utilities received most of their profit during peak times. However, solar generation is strongest during the middle of the day. Thanks to grid priority, solar takes a large part of that peak demand causing the price spike to compete away. So it is not only average electricity prices that have fallen by half since 2008, but also the peak premium has fallen by almost four-fifths. (The Economist, 2013, p.23)

The growth of distributed generation and its threat to the power utility business model depends on technological development and cost. Energy efficiency, falling solar prices, demand-side management and smart grid technology head the list of technological developments that the industry believes will have the biggest impact on their power markets. (PwC, 2013, p.10)

And the situation for utilities will get even worse. The combination of European demand and Chinese investment has decreased the cost of solar panels by about two-thirds since 2006 (see Figure 12). In Germany, the electricity generating cost of a megawatt hour from solar panels has fallen to €150, which is above wholesale prices but below the fixed price that renewables receive and below residential prices. This implies that solar power becomes viable without any subsidy in key European market. There is even a view that utility scale renewable will be competitive with gas-fired power in the short to medium turn. (PwC, 2013, p.10) And that is why renewables are becoming more and more challenging for the old utilities.

Figure 12: The cost of PV installation vs. subsidy to renewables in Germany

Source: The Economist, 2013, p.24

Furthermore, utilities have been hedging in the past few years by selling two-thirds or more of their electricity forward up to 3 years in advance[2]. This has protected them from the full impact of recent price falls. However, as those contracts keep expiring during 2014-15, the depth of the problem for the companies will only fully emerge.

Nevertheless, utilities are not impacted equally in the face of these problems, and they are not empty-handed. Some utilities expand to the renewables business. Other utilities are investing in offshore wind power. Although, medium and large size utilities have been slow to invest in RES, especially in solar power. Utilities own only 7% of renewables capacity in Germany, even less in the Czech Republic. (The Economist, 2013, p.23)

The trouble is that solar energy business is very different from the one they are used to. Usually, the traditional utility has a big expensive power plant with capacity around 1GW. The plant is situated in the middle of a radiating web of grid wires through which the company distributes power. On the other side, photovoltaic panels are relatively cheap, tiny (a medium-sized set of panels may have a capacity of just 10MW) and arranged in a net, not as a hub. The change towards RES is very slow at the moment, but utilities may get more involved eventually.

[2] For example, they are receiving 2011 prices for energy delivered today

How companies respond to these changes will determine whether they will be part of the future or not. According to the PwC Survey, “they will need to be clear-sighted about where their best revenue opportunities lie, act fast to reduce costs or exit unprofitable areas, improve customer service and appeal to a new type of actively engaged customers”. Key element in this will be a strategic view on just how far and at what pace distributed generation will take hold in the market, together with a view on the role and opportunity afforded by gas.

Efficiency savings and performance improvements can considerably help utilities in dealing with the changing environment. According to the PwC Survey (2013, p. 15), 58% of European utilities say there is a scope to achieve cost reduction and efficiency improvements of more than 20%. There is also a big scope for improvement in asset performance (73% of participants), capital project risk management (68%), customer relations and service (61%) and asset risk management (60%).

At the same time, new strategies are needed to identify the best revenue opportunities in a changed and potentially transformed future market landscape. Interestingly, 82% of the companies see distributed power generation as an “opportunity” versus only 18% rating it as a “threat”. Europe also sees the biggest growth (25% now, 60% in ten years time) of a new type of active energy customer (energy-saving and/or energy-generating customer). (PwC, 2013, p.21)

According to the PwC Survey (2013, p.18), the following strategies are likely to be successful in a distributed generation market: services to provide distributed generation (67% of participants), help consumers save energy through efficiency contracts (60%), help “prosumers” share energy through intelligent grids (56%) and become “energy partners” rather than !energy suppliers” to customers (52%).

Companies in Europe are already moving decisively to respond the current market environment. They are mainly embarking on significant restructuring of portfolios, cost reduction and pursuit of higher margin growth. Basically, they are focusing more on downstream activities, such as electricity trading and offering customers’ advice on energy use, instead of power generation. It doesn’t mean that utilities would get out of power generation, but only that the added value in electricity business is slowly shifting more towards the end-user, as confirmed by CEZ Group representatives. Nevertheless, some utilities are cutting off their capacity, but mainly because they are forced by the market situation. For example, three German firms, E.ON, RWE and EnBW, have announced capacity cuts of over 15GW in 2013. EnBW even prognoses that its earnings from electricity generation will fall by 80% in 2012-20, offset by higher earnings from energy services and renewables. “We have to rethink what is our role, and our place in the energy sector,” says its boss, Frank Mastiaux. (The Economist, 2013, p.23)

Summary

In the traditional power utility business model, companies are delivering from a mix of generation, distribution and retailing activities across centralized grids. Companies have been used to high investment credit ratings enabling them to develop capital-intensive asset base with predictable long-term cost of recovery from a mix of regulated and unregulated returns.

The European energy industry is going through a difficult period and has become a sector where words like “security”, “stability”, and “simple rules” may no longer apply. The utilities and energy companies that build, maintain, and operate the world’s electric power systems must respond to a number of critical challenges and opportunities, ranging from resource constraints and environmental strictures, to more proactive consumers and potentially disruptive technologies in the form of decentralized generation.

Nearly all big European utilities are under a lot of pressure as they face a number of common factors, most of them unfavorable. These factors go far beyond the prolonged debt crisis in the European Union and the related sluggishness in the economies of most European countries. They are now being joined by growing regulatory interventions at both the pan-European and national levels, in the form of massive growth in subsidized renewable power sources, shifts in the stance on nuclear energy in major European Union countries, a fading emission rights system, and substantial declines in the prices of energy commodities, especially coal, reflecting in particular growth in shale gas extraction in the USA.

Together, higher supply caused by extra decentralized generation with lower demand caused by the crises and efficiency measures, these factors are bringing about a long-term decline in wholesale electric power prices, which are currently at levels last seen in 2006, and limiting the resources and risking future investments into needed conventional sources. Low wholesale prices also have implications in declining value of the energy companies, connected with declining of their investment role.

Subsidized renewables are bringing about a raise in retail electric power prices, caused mainly by the generous subsidies payments that are transferred down onto consumers. At the same time, decentralized sources with their intermittent generation are causing trouble to electricity grids that have trouble balancing the system, and conventional dispatchable power plants that often have to be turned down or even shut down (mainly gas-fired ones), since the electricity generated with the lowest variable cost (RES) has a grid priority.

While the electricity infrastructure that underpinned much of the economic and social development of the 20th Century continues to perform its original functions well, there is widespread consensus that it must be fundamentally transformed in order to meet the needs of the 21st Century. Those needs above all represent technology developments that allow energy efficiency improvements, falling solar prices that make viable and spread decentralized generation, demand side management of active prosumers, battery storage systems, all together connected with smart grid technologies. Traditional energy companies have to adjust their value chains to those conditions if they want to continue to play their current role.

The research showed that companies today are reacting by hedging, cost reductions and efficiency improvements that can buy utilities considerable defensive headroom in responding to the changes. However, two key elements in this transformation will be a strategic view on just how far and at what pace distributed energy will take hold of the market. Strategies that are most likely to succeed in a more decentralized power landscape with active prosumers involve services to provide distributed energy, help consumers save energy, become a rather partner than supplier, diversify to new markets by using the existing consumer power.

3.2. European Level

Energy is what makes Europe tick. Therefore, it is essential for the European Union to address the major energy challenges facing us today, such as climate change, increasing dependence on imports, the strain on energy resources and access for all users to affordable, secure energy. The EU is putting in place an ambitious energy policy - covering the full range of energy sources from fossil fuels (oil, gas and coal) to nuclear energy and renewables (solar, wind, biomass, geothermal, hydro and tidal) - in an attempt to spark a new industrial revolution that will deliver a low-energy economy, while making the energy we do consume more secure, competitive and sustainable.

According to World Energy Outlook 2013, primary energy demand in the European Union declines by around 7% between 2011 and 2035. Demand for oil drops by one-third (3.7 mb/d). Gasoline and diesel each see a reduction of around 1 mb/d, as strict fuel-economy standards result in reduced demand in transport and the use of oil products in the buildings sector declines. Coal consumption is half today's level by 2035, falling by more than 200 Mtce, almost all of which is steam and brown coal use in the power sector. It takes around two decades for natural gas demand to get back to 2010 levels, with increases in the power sector and in buildings (where oil and coal use falls), but a decline in industry. Renewables increase their share of electricity generation from 21% in 2011 to 44% in 2035, backed by renewables targets and ongoing support in the form of subsidies. Generation from wind grows particularly strongly and it becomes the largest source of renewables-based generation around 2020.

3.2.1. European energy policy and legislation

The EU has had legislative power in the area of energy policy for most of its existence; this has its roots in the original European Coal and Steel Community. However, the first mandatory and comprehensive European energy policy came only in 2006 with the introduction of Green paper: A European strategy for sustainable, competitive and secure energy. This strategy builds the European energy policy on three core objectives:

- Sustainability: to actively combat climate change by promoting renewable energy sources and energy efficiency;

- Competitiveness: to improve the efficiency of the European energy grid by creating a truly competitive internal energy market;
- Security of supply: to better coordinate the EU's supply of and demand for energy within an international context.

In 2008, the EU adopted a series of measures with the objective of reducing the EU’s contribution to global warming and guaranteeing energy supply. The EU's 20-20-20 Renewable energy directive aimed to reduce greenhouse gas emissions by 20%, to increase the share of renewable energy to 20% and to make a 20% improvement in energy efficiency all by 2020 compared with 1990 levels. To achieve the 20 percent target, the directive laid down mandatory national targets to be achieved by the member states through promoting the use of renewable energy in the electricity, transport, heating and cooling sectors. For example, Czech Republic has a target of 13% of RES share in gross final energy consumption and 10% in consumption in transport by 2020. (Europa, 2014)

Only the Treaty of Lisbon in 2009 placed energy at the heart of European activity. It effectively gave it a new legal basis which it lacked in the previous treaties. The Treaty legally includes solidarity in matters of energy supply and changes to the energy policy within the EU. Prior to the Treaty of Lisbon, EU energy legislation has been based on the EU authority in the area of the common market and environment. However, in practice many policy competencies in relation to energy remain at national member state level, and progress in policy at European level requires voluntary cooperation by member states. Thus, the European energy policy became one of the shared competency policies between the EU and member states.

In 2010, Energy 2020: A Strategy for competitive, sustainable and secure energy has been introduced as part of the EU’s 2020 strategy. The aim of this strategy in the period to 2020 is to make far-reaching changes to the way in which Europe produces and consumes energy, while building on what has already been achieved in the area of energy policy. The strategy is structured around 5 priorities:

- limiting energy use in Europe (achieving 20% energy saving by 2020);
- building a pan-European integrated energy market (ensuring the free movement of energy using the internal market);

- empowering consumers and achieving the highest level of safety and security (providing secure, safe and affordable energy);
- extending Europe's leadership in the development of energy technology and innovation (innovative new high performance low-carbon technologies);
- strengthening the external dimension of the EU energy market (Russia, Central Asia and North Africa).

In 2011, strategy towards a low carbon future - Energy Roadmap 2050 has been introduced with a plan to reducing emissions to 80-95% below 1990 levels by 2050.

The aims of the European energy policy are supported by market-based tools (mainly taxes, subsidies and CO2 emissions trading scheme), by developing energy technologies (especially technologies for energy efficiency and renewable or low-carbon energy) and by financial tools. (Europa, 2014)

3.2.2. Existing tools in the European energy policy

As stated above, the European energy policy is built on three core objectives – sustainability, competitiveness and security of supply. Those objectives are built around the two main pillars – creation of single energy market and combat of climate change through decarbonization of production. Both pillars are accompanied by strategic tools to achieve them. In terms of the single market, it is the liberalization of electricity markets and integration of electricity systems. In terms of decarbonization, it is the EU emission trading system and national renewable energy subsidy systems. Altogether, they should create a balanced development of effective and low carbon economy.

So, one of the EU's priority objectives is to create a genuine internal energy market. The existence of a competitive internal energy market is a strategic instrument in terms of giving European consumers a choice between different companies supplying electricity and gas at reasonable prices. At the same time, it is instrument making the market accessible for all suppliers, especially the smallest and those investing in renewable forms of energy (through unbundling process). There is also the task of setting up a framework within which the mechanism for CO2 emission trading and for RES subsidy can function properly without distorting the market. Nevertheless, making the internal energy market a reality will depend above all on having a reliable and coherent energy network in Europe and therefore on sufficient infrastructure investment. A truly integrated European energy market will contribute to diversification and thus to security of supply. (Europa, 2014)

Liberalization of electricity markets

The liberalization of the electricity markets began in the 1990s by gradual opening of state monopolized markets to the competition. The main reasons behind liberalization:

- to distinguish clearly between competitive parts of the industry (e.g. supply to customers) and non-competitive parts (e.g. operation of the networks);
- to oblige the operators of the non-competitive parts of the industry (e.g. the networks and other infrastructure) to allow third parties to have access to the infrastructure;
- to free up the supply side of the market (e.g. remove barriers preventing alternative suppliers from importing or producing energy);
- to remove gradually any restrictions on customers from changing their supplier;
- to introduce independent regulators to monitor the sector.

There are three packages for the liberalization of electricity markets. The first package for the liberalization of electricity market was adopted in 1996 with the Directive 96/92/EC (transposed into member state's legal system by 1998). This Directive establishes common rules for the generation, transmission and distribution of electricity. It lays down rules on the organization and conduct of electricity market access, criteria and procedures applicable to tendering, licensing and exploitation of networks. The completion of a competitive electricity market is an important step towards completing the internal energy market. (Europa, 2014)

Directive 2003/54/EC, which has introduced the second package for the liberalization of electricity market in 2003 (transposed into member state's legal system by 2005), emphasizes that fair and impartial access to network is needed as far as the appropriate transmission and distribution systems (vertically integrated enterprises with a distinct legal personality – unbundling process) and finally it is crucial to ensure the independence of transmission system operators and distribution over the producers and suppliers.

The third package for liberalization of the electricity market in 2009 includes Directive 2009/72/EC (repealing the previous directive2003/54/EC) and the Regulation 714/2009 on conditions network access for cross-border exchanges in electricity and Regulation 713/2009 establishing the Organization for Cooperation of Energy Regulatory Authorities. This energy package was considered as the completion of the internal EU energy market and it is supposed to separate the production from distribution, transportation and delivery. (Europa, 2014)

The establishment of the internal market in electricity is particularly important to increase efficiency in production, transportation and distribution of electricity, while enhancing security of supply and the competitiveness of European economy with respect to the environmental protection. There were established, under the principle of subsidiary, general authorities for the organization of energy markets at the EU level, but the definition of specific terms application were left to member states which had decided which best suited to their particular situation status.

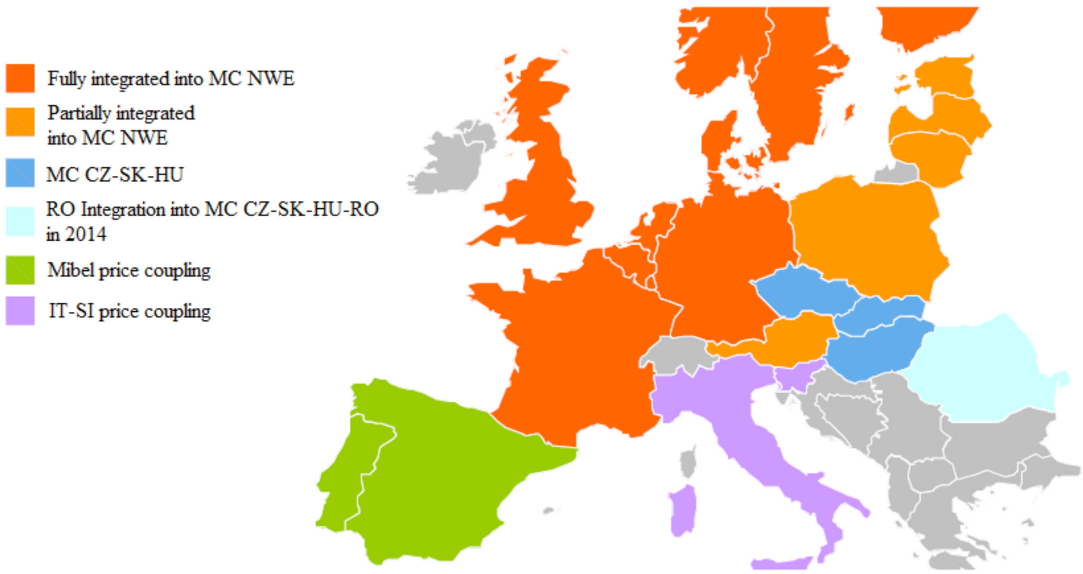
Integration of electricity systems in Europe

An important trend in the European electricity sector is the integration of the national electricity systems (ES) into continental interconnected system. The integration of ES is supported by legislation, both at the EU and national levels. Strong international interconnection along with the growth of the share of renewable energy sources, however, causes an increase of unplanned and non-traded electricity flows, which may endanger the security of national EC. In Central Europe, this problem exists between the systems of Germany, the Czech Republic and Poland, and leads to request of technical solutions such as by installing Phase Shifting Transformers on overloaded grid lines. Technical transmission options are in actual operation largely used by physical flows and blocked by the necessary technical provisions. For the trading purposes then remains only a small part of the technical available capacity, leading to the creation of barriers in international electricity trade.

The electricity market of individual countries is continuously getting closely interconnected and leads towards a single European market. It is not expected to create one central place of exchange, but instead trading rules are getting united on existing exchanges, while promoting implicit auctions. Market coupling facilitates international electricity trade, supports the convergence of electricity prices and reduces the influence of the dominant national energy companies on the pricing of electricity. There are already regional markets created. (OTE, 2013, p.9)

Central Europe is currently preparing two projects related to the interconnection of spot markets on the principle of market coupling. For the involvement of individual countries in these common markets, see Figure 13. Germany and partly Austria and Poland will soon be interconnected with more markets in Western Europe in the North-Western Europe Market Coupling (MC NWE), which will be the largest interconnected market in Europe. Czech Republic is directly connected to the common market coupling with Slovakia, Hungary and in the future with Romania. The map also shows other interconnected markets in Europe. It is the market coupling on the Iberian Peninsula (MIBEL) and market coupling of Italy and Slovenia. The interconnection of these mentioned markets into a single European one is expected in 2015.

Figure 13: Interconnected markets in Europe in 2014



Source: OTE, 2013, p.10

However, a significant risk for future development of market coupling is the current unstable situation on European electricity market. (OTE, 2013, p.10)

EU Emission Trading System (ETS)

Directive 2003/87/EC established a scheme for greenhouse gas emission allowance trading in the EU for the cost-effective reduction of such emissions. This scheme launched in 2005 enables the EU and the Member States to meet the commitments to reduce greenhouse gas emissions made in the context of the Kyoto Protocol (adopted in 2002). Installations operating in the energy sector, iron and steel production and processing, the mineral industry and the paper and board industry are automatically subject to the emission trading scheme. In 2012, the EU ETS was also extended to the airline industry, though this has been paused for one year given the possibility of a global system for these emissions.

The scheme has been divided into a number of "trading periods". The first ETS trading period lasted three years, from 2005 to 2007. The second trading period ran from 2008 until 2012, coinciding with the first commitment period of the Kyoto Protocol (CO2 reduction by 8 % in relation to 1990 levels between 2008 and 2012). The third trading period began in 2013 and will span until 2020. Compared to 2005, when the EU ETS was first implemented, the proposed cap for 2020 represents a 21% reduction of greenhouse gases. (Europa, 2014)

The EU ETS has been criticized for several failings, including: over-allocation, windfall profits, price volatility, and in general for failing to meet its goals. Proponents argue, however, that the first trading period was a "learning phase" designed primarily to establish baselines and create the infrastructure for a carbon market, not to achieve significant reductions. That is why the EU ETS has seen a number of significant changes. The third trading period turns to auctioning a majority of permits rather than allocating them freely; harmonization of rules for the remaining allocations; and the inclusion of other greenhouse gases.

The price of EU ETS carbon credits has been lower than intended, with a large surplus of allowances, in part because of the impact of the recent economic crisis on demand. In 2012, the EU announced a delay in auctioning of some allowances. Nevertheless, as mentioned in the previous chapter, low carbon permits together with low coal prices added to the difficult situation on energy markets by decreasing the generation cost in coal-fired power plants, giving them advantage before more environment friendly and flexible gas-fired ones. Therefore, more significant long-term reforms to reduce oversupply are under consideration. (Europa, 2014)

RES subsidies

National support schemes for RES are a key mechanism to achieve a higher share of renewable energy generation in EU, while at the same time attract interest in relations to the differences between member states' scheme and the overall costs to consumers. RES subsidies take a variety of forms, including blending mandates, quotas, portfolio obligations, tax credits and feed-in tariffs, which all offer a higher return than market prices, to offset higher costs. With schemes like feed-in tariffs, blending mandates or portfolios and quota obligations, this remuneration is paid by the end-users (though some schemes, such as tax credits are funded from government budgets). Many forms of support mechanisms are specific to electricity produced by renewables capacity installed in a particular year, and have a fixed duration, typically twenty years.

In addition to playing a crucial role in driving down the costs of renewable energy technologies, subsidies to renewables can have important co-benefits[3]. But support schemes for renewables need to be carefully designed to ensure their efficiency and effectiveness. They should be predictable and transparent and, where possible, provide for competition between technologies best suited to meet short- and long-term objectives. They need to be accompanied by ambitious, yet credible, targets and offer support differentiated according to the maturity of each technology. As cost reductions are achieved, the level of support provided for new installations needs to decline to avoid unnecessary increases in the cost of energy services. (WEO, 2013, p.225)

RES generation receiving support has been increasing in the past years. The Czech Republic has seen increase from 4,3 million MWh in 2010 to 6,2 million MWh in 2011, Germany from 82,2 million MWh in 2010 to 102,2 million MWh in 2011 – one of the highest additions in EU. The share of total electricity generated receiving support accounts for 9% of the total overall electricity generation in the EU (Czech Republic – 5,0%, Germany – 13,1%). The average level of RES support in the EU was around 6,85 €/MWh in 2010 (Czech Republic – 8,23 €/MWh, Germany – 17,98 €/MWh), and

[3] RES benefits – energy security and diversity, environmental protection, sustainability, energy access and affordability, etc.

increasing during 2010-2013 with the increasing of RES generation. (CEER Status Review, 2013, p.10 and 19)

Due to such generous support schemes, RES generation in the EU has unexpectedly increased between 2010 and 2012 (especially PV installations). This sharp increase is naturally connected with rapid increase in expenditures for its support, and thus with the implication of increasing end-user electricity prices, since many of the support schemes are financed through the possible pass down of supplier’s costs to end users. Therefore, a number of countries have seen changes in the way RES electricity support schemes are financed, including the Czech Republic and Germany. (CEER Status Review, 2013, p.13)

For example, to prevent potential abuse of the system and to stop further construction of large solar farms, the Czech Republic has radically cut the support and introduced a special tax for solar electricity in 2013.

RES operators can choose from 2 options of support (see Figure 14):

- Feed-in tariffs (electricity purchased by distributor)
- Green bonuses (electricity sold on the market, bonuses paid by distributor, level of green bonuses is derived from feed-in tariffs)

Figure 14: Czech RES support since 2013

Renewables type (prices for installations put into operation in 2013)	**2013 feed-in tariff (€/MWh)**	**2013 green bonus (€/MWh)**
Solar <30 kW	97-119	75-114
Solar >30 kW	0	0
Wind	84	62
Small hydro	80-151	48-95
Biogas stations	76-141	36-99
Pure biomass burning	82-129	48-90

Source: ERU, 2013

Fees for renewables are part of regulated distribution tariffs charged to final consumers. Feed-in tariffs are set by a regulator to ensure 15-year payback period. During operation of power plant, they are increased each year by PPI index or by 2% at minimum and 4%

at maximum. Tariffs for new projects can decrease by 5% at maximum. Support is provided for 20 years to solar, wind, pure biomass and biogas plants and for 30 years to hydro plants. Solar plants put into operations in 2009 and 2010 are obliged to pay 26% withholding tax until 2013. (ERU, 2013)

3.2.3. Future tools to deal with current changes in Europe

Over past 30 years European governments have been trying to deregulate energy markets, privatizing state-owned companies and splitting electricity generation from transmission and distribution. The aims were to increase competition, boost efficiency and cut prices. Those goals are now harder to achieve. Renewable energy has grabbed a growth share of the market, pushed wholesale prices down and succeeded in its goal of driving down the price of new technologies. But the subsidy cost also has been large, the environmental gains non-existent so far and the damage done to today’s utilities much greater than expected. Europe sees itself as pioneer of low carbon energy. If so, it needs to design a much better electricity system that rewards low carbon energy without reducing reliability and imposing undue and unnecessary costs.

Today, obtaining finance and inability to recover the cost of new generation via regulated energy tariffs are major barriers for utilities to new investments. The issue of what policy design features are need to enable system operators to balance a system with high levels of intermittent generation is an urgent one for regulators. According to the PwC Survey, measures to introduce capacity schemes, demand response and demand-side management market, the ability to curtail intermittent generation during low demand periods, they top the list that survey participants think policy-makers should introduce. (PwC, 2013, p.34)

Governments and policy-makers (including the EU) have the difficult task of handling big issues of supply availability, affordability and environmental impact. And increasingly the tensions between these goals are coming to the front more and more. Nowadays, there is a raising attention to electricity affordability, as well as to concerns about blackouts as reserve capacity gets stretched. There is a feeling among companies that regulation is facing something of a crisis and is at a crossroads, with the era of liberalization fading and a new era of greater certainty needed.

Functioning of energy market must be secured in all 3 time frames. In the frame of each year, it is the ability of normal operation by covering variable expenses of generation (raw material, CO_2). In the frame of 2-3 years, it is the service ability by covering fixed expenses (OPEX). And in frame of plant lifetime, it is the ability to construct a new power plant or modernize it by covering investment expenses (CAPEX). The first option to achieve this situation is a liberalized market without unnecessary regulation (RES support), where prices are set by the marginal cost of electricity. In case of capacity scarcity, prices are investment signal.

The alternative is a regulated market with a system of instruments that compensate for the market inability to function in all 3 time frames. In the first time frame, it is still the Energy market, where the price is set by the marginal cost of electricity. In the second time frame, it is the Capacity market (can be all-European system) or Strategic reserves/payments (national systems), where the expenses are covered by payments for possible capacity generation to prevent scarcity. In the third time frame, it is instruments to ensure payback period and new development in long term. (CEZ presentation)

Capacity mechanisms in Europe

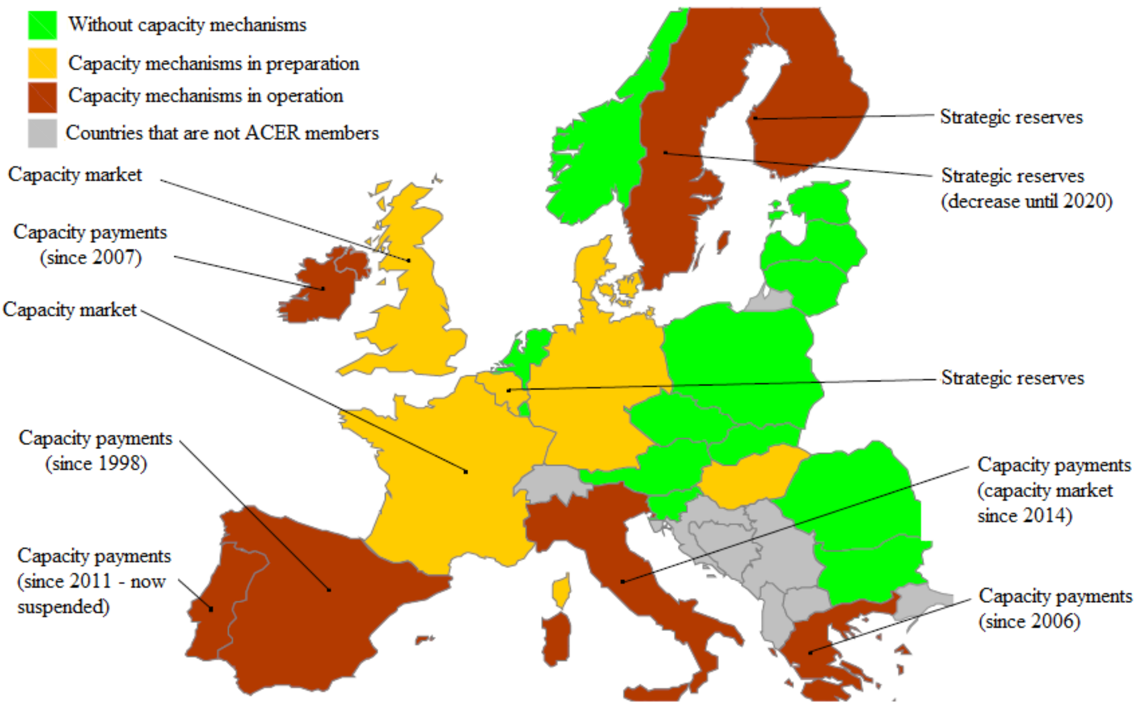
In 2012, the European electricity market experienced a dramatic increase in electricity generation from subsidized resources, which pushes the electricity prices down. The period of low spot prices is growing and thus the future of European electricity market is uncertain. Except for the mentioned trends described above, there is a relatively new growing opinion that the energy market does not in all circumstances need to support the provision of sufficient capacity for reliable electricity supply, particularly in the long term. This opinion is currently supported by the current conditions on the European electricity market, where low electricity prices and emission allowances do not motivate companies to invest in generation capacity. Subsidized electricity prices from renewable energy sources and non functional EU ETS System distort the market. Political sensitivity to blackouts together with the uncertainty of whether investors will build capacity in sufficient volumes and rational structure led a number of member states[4] to the introduction of capacity mechanisms, whose objective is to provide investors with an incentive ensuring sufficient capacity available in the systems.

[4] The implementation of mechanisms to ensure a reliable generation capacity outside the EU is also being analyzed in the USA, Canada, or Australia.

Some capacity mechanisms are already used on the European markets:

- Capacity payments: TSO/regulator sets the required capacity and its price, fully regulated business (Ireland, Spain)
- Capacity auctions: TSO/regulator sets the required capacity and auctions sets its price (proposed in UK)
- Capacity certificates: Supplier must ensure sufficient capacity of peak supply by buying capacity certificates or by paying penalty (proposed in France)
- Strategic reserves: TSO/regulator supports specific resources to be operational in scarcity situations (Finland, proposed in Germany)

Figure 15: Current state of capacity mechanisms implementation in Europe



Source: OTE, 2013, p.11

The restructuring of the electricity market has significantly progressed in Great Britain, where a new Energy Act has been approved in 2014. Under this Act, a reform of the electricity market will be implemented, involving a change in RES support system and the introduction of capacity market and carbon price limits. For the Czech Republic is essential that a similar reform is being prepared in Germany, who is a major player in the Central European electricity market. The European Union, but also other countries that have not yet implemented capacity mechanism, grow concerns that a lack of consistency in common approach may disrupt the market and disadvantage some countries, particularly in the international electricity trade. It is therefore necessary to carefully watch the situation, so that the Czech energy companies would not be disadvantaged in the process. (OTE, 2013, p.11) Much of the inconsistency that exists in the implementation of capacity mechanisms in the EU shows Figure 15.

Capacity market can ensure sufficient amount of capacity in the system and can stop turning down gas-fired plants. However, it does not remove the investment uncertainty and in addition, capacity payments further increase the pressure on electricity prices for the end consumers.

Instruments to ensure payback period and new development in a long-term

That is why instruments to ensure payback period and new development in the long-term are needed as well:

- Fixed redemption price of electricity: fixed redemption price set by regulator outside the wholesale market (Czech Republic, Germany for RES)
- Contract for Difference (CfD) with fixed even up: the even up of higher or lower market price to the level set by regulator (Great Britain)
- Even up with certificates: to cover investment costs, electricity seller is obliged to buy special certificates for its customers (Poland, Romania for RES)
- Long-term regulated electricity prices: Regulated prices based on expenses or regulated actives and allowed revenue (France – dual price system)
- Consumer financing or PPF: application of investment burden on consumers, or ownership by majority of consumers (Finland, France)

The European Commission believes that the primary goal is the completion of the single electricity market. Capacity mechanisms are economically inefficient, maintain the fragmentation of markets and strengthen the position of fossil fuels. Individual national schemes are a barrier to the single market and therefore there is a rising need for harmonization of rules. It is also necessary to seek comprehensive solutions and to reform the electricity market. Nevertheless, individual member states are quickly introducing capacity payments as a necessity to secure public service of electricity supply.

To help ease the current difficult situation, ten European utilities (CEZ, Enel, Eni, E.ON, RWE, GasTerra, GDF Suez, Iberdrola, Gas Natural and Vattenfall) are joining forces with the aim to start dialogue and warn EU over current energy risks. Among their first proposals are for policy-makers "to work quickly to introduce a system of capacity payments, which would incentivize gas-fired generation to remain online and prevent more plants to shut down." (CEZ Interview)

At the same time, in order to deal with the current situation, utilities are suggesting the following:

- EU should prioritize and set only one of the goals – either CO2 emission levels (preferably), or RES share of generation - both tools are contradicting each other. One clear goal with EU ETS mechanisms would create a stable investment environment while protecting the environment

- In order to decrease CO2 emissions, it is important to restart EU ETS and trade only with reformed and flexible permits, including RES, on all-European level; support RES only with market based instruments, cancel feed-in tariffs

- Refuse system of capacity payments on member states level, since it does not contribute to long-term European goals; set an optimal system of all-European capacity market, including complex analysis of its introduction and possible exits

- Use of targeted market interventions (such as CfD) on member state level only in specific situations like the urgent security of supply concerns when there is not enough time to wait for the market reaction

Such actions would secure the three core European energy objectives by establishing a solid instrument to secure enough capacity, and by setting socially optimal level of decarbonization. (CEZ presentation)

Summary

Since energy is one of the shared competencies, European energy sector is highly influenced by the EU energy policy with its three main goals of energy competitiveness, sustainability and security of supply. Tools to ensure such goals include liberalization, unbundling and integration of energy markets for the competitiveness, as well as EU Emission Trading System and RES subsidy mechanisms to promote sustainability.

Still, many suggest that regulation is facing something of a crisis, since they have trouble of grappling the big issues of supply availability, affordability and environmental impact during current changes. The issue of what policy design features are needed to enable system operators to balance a system with high levels of intermittent generation is an urgent one. Capacity mechanisms, that would incentivize gas-fired plants to remain online and prevent more plants being shut down, are one answer to this. They are step into more regulated business environment, where utilities are paid to serve as a capacity provider. However, they don't remove the investment uncertainty. Measures, such as demand response, demand side management and other market based instruments to secure long term payback period, should be introduced to balance intermittent generation.

European utilities agree that any capacity payments should be all-European, since individual member state solutions would disrupt the liberalized market. At the same time, utilities believe that two instruments to promote RES are contradicting each other. Only reformed EU ETS should remain to set socially acceptable level of emissions. No RES subsidies would bring stability into investment decision-making and set a fair ground to all generating sources.

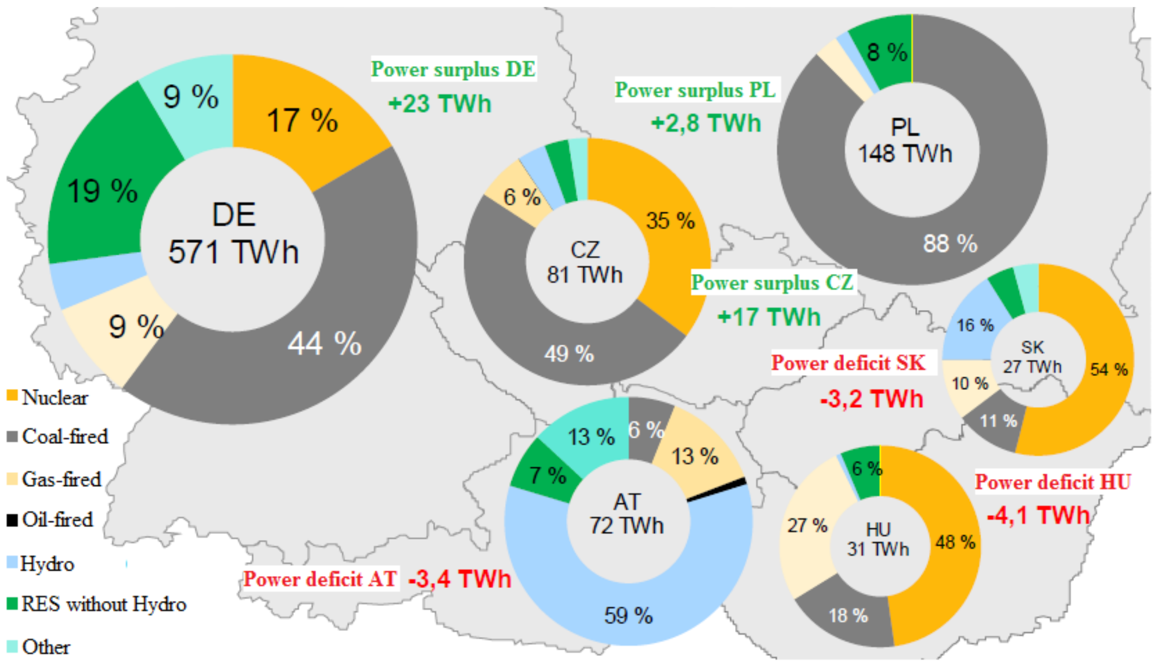
3.3. Regional and National Level

Specifics of the Central European region, as well as Czech electricity market are important to understand the environment, in which CEZ Group operates.

3.3.1. Specifics of Central European region

Central European region includes besides the Czech Republic also its neighboring countries Germany, Poland, Slovakia, Austria and Hungary. Region currently has a significant export character (over 30 TWh); however, the power surplus is not distributed evenly. There is a strong north-south imbalance between the Czech Republic, Germany and Poland on one hand and Austria, Slovakia and Hungary on the other hand (see Figure 16).

Figure 16: Structure of electricity generation by fuel in Central European region in 2012



Source: OTE, 2013, p.6

Since the Czech Republic is located in the middle of the region, its electricity grid gets affected by those imbalances the most. Overall in 2012, the Central European region generated 930TWh of electricity, around 30% of electricity generation in the EU27. The dominant player in the region is Germany with an annual generation of 571 TWh, which is 61.4% of all generation in the Central Europe. At the same time, Germany is also important in the growing RES capacity. That is why the German electricity market is so important for the Czech Republic and in great degree influences it. (OTE, 2013, p.6)

Leading wholesale electricity market in Central Europe is European Energy Exchange (EEX), based in Leipzig, Germany. Electric power, natural gas, CO2 emissions allowances, coal and guarantees of origin are all traded on EEX spot and derivatives markets. Another local energy exchange is Power Exchange Central Europe (PXE), based in Prague, which trades power futures for the Czech Republic, Slovakia and Hungary.

In the future, the generation structure in the region is estimated to change dramatically. The biggest growth potential is expected in renewable energy sources (excluding hydro power plants) and in gas-fired plants, while the electricity generation from fuel oil and coal are expected to significantly decrease. View on nuclear energy in the region is split. Austria and Germany (since 2011) don't support it, whereas the rest is for the future development and gives it a strategic importance. Nevertheless, according to the IEA, the electricity generation in the EU27 should increase by about 14% production till 2035.

Changes in the electricity grids and networks are equally important. Given that the operation and development of networks belongs to the regulated business activities, it is necessary to ensure sufficient funds for their reconstruction and development. The changes will take place in three levels:

- Strengthening interstate connections
- Gradual development and implementation of intelligent networks (smart grids), supporting the inclusion of distributed generation, electricity storage and active response on the consumption side
- Gradual building of a European super grid, ensuring the electricity transportation from regions with surplus generation to deficit locations

By 2020, the Central European region can expect a decline in installed capacity of conventional sources by 10 GW and an increase in the installed capacity of renewable energy sources by 40 GW, from which intermittent sources will consist of 33 GW. The construction of large conventional sources is expected mainly in Germany, since they are already in the construction phase. (OTE, 2013, p.7)

3.3.2. Specifics of Czech electricity market

Electricity is considered to be a strategic commodity on a market environment, its safe and reliable supply is a condition for ensuring national security. The main document setting strategic priorities and development plans in Czech energy sector is the State Energy Conception (SEC) of the Czech Republic. It is prepared and regularly updated by the Ministry of Trade and Industry of the Czech Republic and approved by the Czech government. It follows the three core objectives of sustainability, competitiveness and security of supply.

Czech energy policy expressed in SEC is consistent with EU energy strategy, taking into account the specifics of the Czech Republic and its emphasis on the use of domestic energy (mainly coal – 49% share in fuel mix) contributes to strengthening the European energy security. The emphasis on the nuclear energy development and the phasing out of coal-fired power plants represents a significant boost for low-carbon scenario of future development. Even thought that efforts to minimize the negative impact of energy on the environment are supported, the Czech Republic, however, does not have favorable conditions for the massive development of renewable energy sources. (OTE, 2013, p.4)

This has implications for a relatively high Czech independence in terms of electricity generation. Current level of independence is 70% and is the third highest in the EU. However, due to decreasing extractable coal reserves and also increasing natural gas supply from Russia and Norway, this independence should be decreasing. In order to stop this trend, projects supporting rational economic use of domestic resources are considered (such as extension of coal mining and shale gas production).

Other specifics of the Czech electricity markets include its complex and large system with location in the Central Europe and high interconnectivity with other countries. This means that Czech energy system has to be prepared to virtually instantaneous response to change in generation base, networks or consumption of electricity. At the same time, Czech system is part of the European one, and thus it must be able to react quickly to changes even in remote regions. Moreover, since electricity cannot be in commercially significant extent stored, balance in the system must be ensured at all times. (OTE, 2013, p.3)

Also, reconstruction and development of energy system is very time and capital intensive and the investments have a long lifetime. Today's decisions affect the ES state for many years. Therefore, it is necessary to analyze more carefully the possibilities of the energy fuel mix development. The main goals for electricity industry in the Czech SEC (2010):

- Ensure power surplus of generation balance based on a diversified fuel mix and the maximum use of available domestic primary sources.

- Provide high security, reliability and energy resilience through appropriate size and structure of reserve capacity, energy storage, demand side response (DSR) and the capacity of the transmission and distribution networks.

- Ensure the development of systems and ES management tools through efficient use of new technologies in distribution systems (smart grids), expansion of regional cooperation in system management and enlargement of reserves. Encourage the development of distributed and centralized storage systems (pumped storage hydro plants, electricity storage and others).

- Promote the rapid and full integration of the energy markets in Central Europe and the development of market mechanisms that facilitate market access and change of supplier at the same time with adequate control of market risks. Ensure open and highly competitive environment with effective control against the market dominance and market abuse. Ensure market environment in the European electricity market with a minimum range of market distortions.

- Maintain and enhance the high transit ability of networks and the openness of the Czech energy sector. Ensure the continued fulfillment of the reliability criteria and the adequacy of future transmission needs.

- With regard to the strategic importance of the energy sector, remain full state ownership in transmission company CEPS, as well as maintain a dominant share of state ownership in CEZ Group

Czech electricity market structure and liberalization process

Czech electricity market is regulated by the Energy Act, which sets out the rights and obligations of the various entities on the liberalized market and also the application of third-party access to the transmission and distribution networks and customer’s rights to freely select their supplier. The main supervision state office for the energy field in the Czech Republic is the Energy Regulatory Office (ERO) established in 2001, which is in charge of price regulation (some parts of the price structure are regulated), granting of licenses, protection of consumer’s interest, support of RES and combined electricity and heat generation, support of market competition and inspection in energy sector.

The process of gradual electricity market liberalization was launched in 2002 in line with EU’s legislation with the intention to create new model for electricity trading, based on regulated third-party access to networks, which separated activities such as electricity generation and trading from those having the nature of natural monopoly - unbundling process. (ERO, 2010, p.31)

In connection with the making networks accessible for electricity generators, an entity that would process balances of electricity supply bids and offers, a market operator, had to be established on the market. At the beginning of 2002, the Czech electricity and gas market operator (OTE) launched its operation, started to organize the spot market, and began evaluating and clearing imbalances in line with the rules formulated by the ERO.

The Czech electricity industry is characterized by a sufficient number of market players, with a dominant position of CEZ Group in all parts of the electricity value chain. In terms of electricity generation, CEZ Group has an almost 75% share, followed by other important producers like Sokolovska uhelna (3%), EPH (3%), Dalkia Group (2%), Alpiq (2%), and other small generators (15%), with overall generating capacity of 81 TWh per year. (Energostat, 2014)

By 2020 we can expect shutdown of more than 1 500 MW of installed capacity in large conventional plants (Ledvice, Melnik III, Prunerov I and part of Prunerov II), and commissioning of single large plant in 2015 (Ledvice 660 MW). The newly built gas-fired power plant PPC Pocerady is expected to have lower utilization until 2020, associated with low electricity prices on the stock exchange and low prices of CO2 allowances. The operation of other conventional power plants will be limited by the lack of coal. Further, an increase of 150 MW of wind power plants and 250 MW of solar power plants is expected by 2020. The outlook for 2030 expects a further pronounced shutdown of large coal-fired power plants (Chvaletice, Pocerady, Detmarovice) and the commissioning of two new nuclear blocks (NPP Temelin 3 and 4).

The backbone of the electricity transport system is the transmission system (400 kV and 220 kV lines) operated by CEPS, which is wholly owned by the State (until 2003 fully owned by CEZ Group, today 51% by National Property Fund, 34% by Ministry of Finance, and 15% by Ministry of Labor and Social Affairs). There is also a distribution system of eight regions (110 kV and lower voltage lines), which are connected to the transmission system. Until 2005, there used to be eight independent distribution companies. After acquisition and merger in 2006, only three distribution companies remained, dividing the territory – CEZ Group (5 northern regions), E.ON Koncern (2 southern regions), and PRE Holding group (1 region – capital Prague). (ERO, 2010, p.31)

In 2007, the principle of trading on the Czech electricity market changed profoundly. The principle applied until then, wholesale electricity marketing based on annual auctions organized by CEZ Group and additional bilateral contracts between electricity generators and traders, was replaced by continuous trading in electricity at the Prague Energy Exchange (current name is Power Exchange Central Europe). This change had the heaviest influence on electricity suppliers, since they had to adjust their business strategies for buying electricity on the market. However, the introduction of trading at the energy exchange also had a certain impact on final customers, who gained the opportunity to actively influence their price of energy. (ERO, 2010, p.33)

The process of electricity market opening was completed in 2006. As from this date, all final customers (residential, commercial, industrial) can freely select their electricity supplier. The process of electricity supplier switching was taking off only slowly in the first years of the liberalization, since new traders, independent of vertically integrated undertakings, were entering the market. By 2010, competition could be felt in full in all customer segments. According to the data recorded by OTE for households; almost 200 thousand customers changed supplier in 2010, 300 thousand in 2011 and 450 thousand in 2012, with the raising trend continuing till today.

Today, there is around hundred of electricity supplying companies on the Czech market of total size around 9000 thousand customers. The biggest players are CEZ Group (40% share), E.ON Koncern (15% share) and PRE Holding Group (10% share), with many small alternative suppliers fast growing. While electricity consumption remains stagnant in the Czech Republic during recent years and in 2013 (58,7 TWh). it was 3% below its peak in 2008 (60,5 TWh). (Energostat, 2014)

Summary

Central European region is specific by its north-south imbalance in electricity generation, where northern countries (Germany, Poland and the Czech Republic) have surplus of power, compared to southern countries (Austria, Slovakia, Hungary) having a deficit of power. This has implications for the highly interconnected Czech grid that is situated in the middle and has to balance the increasing generation from intermittent sources in the region. The situation will get worse, since especially Germany is expected to increase RES generation due to withdrawal from nuclear power.

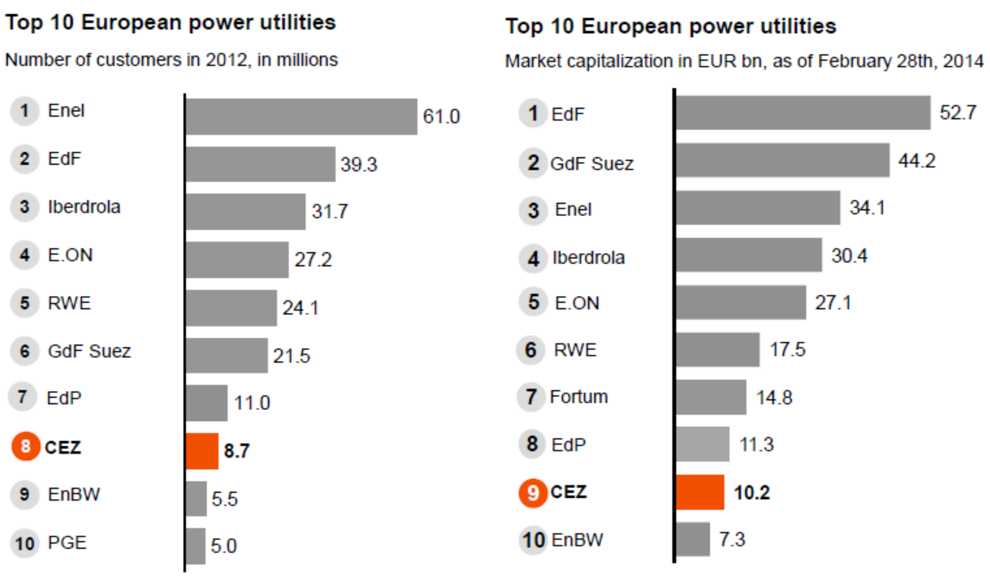
Czech electricity market is an integral part of wider European electricity market, fully liberalized since 2006. Czech Republic remains net exporter of electricity and enjoys high level of electricity independence (70%), since majority is generated from domestic sources, especially coal. At the same time, Czech Republic doesn’t have favorable environment conditions for renewables and that is why it prefers to focus on nuclear energy, which has a long tradition.

3.4. Company Level – CEZ Group

CEZ Group is an established electricity utility with strong position in a number of countries in Central and Southeastern Europe (CEE) and Turkey, headquartered in the Czech Republic since 1992. Its principal businesses operations include generation, distribution, and trading of power and heat, trading and sales of natural gas, and coal mining. CEZ Group has around 30 thousand employees throughout its all subsidies.

The largest shareholder of the parent company (CEZ, a. s.) is the Czech Republic government – Ministry of Finance (on December 31, 2013 its share was nearly 70%). CEZ's shares are traded on the Prague and Warsaw Stock Exchanges, where they form part of the PX and WIG-CEE stock exchange indexes. CEZ Group ranks among the top 10 largest utility companies in Europe, both in terms of number of customers (almost 9 million) and in terms of market capitalization (around € 10 billion) (see Figure 17).

Figure 17: CEZ Group ranking position in Europe



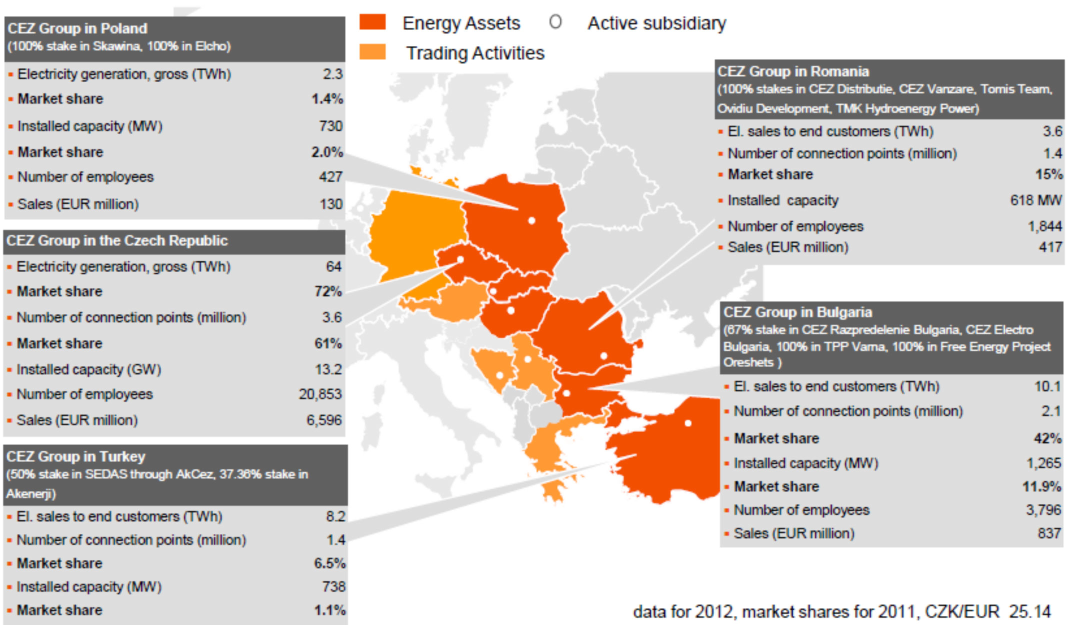
Source: CEZ Group presentation, 2014, s.4

A crucial part of CEZ Group's mission is to maximize the return on investments in the Group, and ensure long-term growth in shareholder value. As part of its business activities, CEZ Group upholds principles of sustainable development, supports energy efficiency, rolls out new technologies, contributes to the development of society as a whole, creates environment favorable to its employees' professional growth, and operates its power plants and other equipment in accordance with safety standards. Although the corporate culture is focused on safety, performance and continual improvement of internal efficiency, at the same time CEZ Group's business activities are governed by strict ethical standards – this includes acting responsibly toward employees, local communities, society, and the environment. (CEZ Group Annual Report 2013, p. 2)

In the Czech Republic, CEZ Group companies mine and sell coal, generate and distribute electricity and heat, trade in electricity and other commodities, sell electricity, heat, and natural gas to end customers, and provide other services. The generation portfolio consists of nuclear, coal, gas, hydro, and other renewable sources. To ensure continued success in the Czech Republic marketplace, which is crucial to CEZ Group in terms of its business interests, the Group is carrying out an extensive program of renewal, upgrades, and development of its generation portfolio, including preparations for building new nuclear sources, as well as upgrades and development of its distribution networks. In forming its strategy, CEZ Group responds to new power industry trends. It enters new business areas and offers customers innovative products and services tailored to their needs.

At the international level, CEZ Group focuses in particular on markets in Central and Southeastern Europe, where it operates primarily in the areas of distribution, sale, and generation of electricity from coal-fired and renewable power sources, as well as trading in electricity and other commodities. (see Figure 18)

Figure 18: CEZ Group operations and position in CEE markets



Source: CEZ Group presentation, 2014, s.3

CEZ Group holds generation and distribution assets in Poland, Romania, Bulgaria, Hungary, Slovakia, and Turkey. In Poland, two black coal-fired power plants near the country's border with the Czech Republic are part of CEZ Group (2% market share), as is a development company that is preparing to build wind power plants. In Romania, CEZ Group is involved in the generation of electricity from renewable sources of energy – wind in particular – in addition to electricity distribution and sales operations (15% share). In Bulgaria, it distributes and sells electricity in the western part of the country (42% share), generates power in a coal-fired power plant (12% share), and is developing renewable sources. In Turkey, CEZ Group, together with a local partner, operates a distribution company (6,5% share), generates electricity in gas, hydro, and wind power plants (1% share), and is preparing to build additional power sources.

CEZ Group conducts wholesale trading operations in electricity and other commodities in a number of European countries. In addition to the Czech Republic, CEZ Group sells electricity and natural gas to customers in places such as Romania, Bulgaria, Turkey, Hungary, Poland, and Slovakia. (CEZ Group Annual Report 2013, p. 3)

3.4.1. Group's value chain

CEZ is leader in the Czech electricity market with a vertically integrated portfolio of activities and subsidiaries in lignite mining, power and heat generation, power and heat distribution and power, heat and gas supply (see Figure 19).

Figure 19: CEZ Group's integrated portfolio of activities in the Czech Republic (2012)

Source: CEZ Group presentation, 2014, s.39

The current state of CEZ Group's structure and value chain has been formed in 2004-2005 after the finishing of unbundling process in the Czech Republic. Slight transformations due to the changes have been occurring ever since, mainly in the form of diversification and further vertical integration.

Lignite mining

CEZ fully owns the largest Czech mining company (Severoceske doly), which represents 53% share of mined coal in the Czech Republic. Remaining two coal mining companies (Sokolovska uhelna, Czech Coal) are privately owned. CEZ covers 63% of its lignite needs internally, the remaining volume through long term supply contracts. In March 2013, CEZ signed a long term contract with Czech Coal and secured fuel for almost 50 years with very low coal prices. (CEZ Group Annual Report 2013, p. 103)

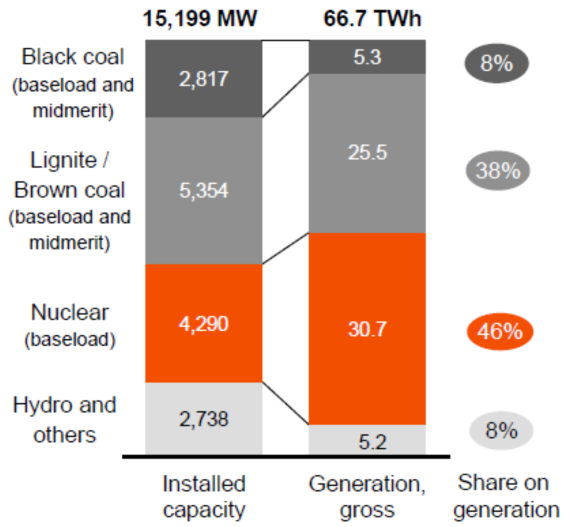
Profitability of the mining business has been considerably decreased with the current very low coal prices caused by its surplus. Together with decreasing sales caused by lower demand, the mining part of the business is considerably affected. However, since lignite mining is very closely connected with the coal-fired generating units it supplies, it is strategically important and convenient for CEZ to secure enough amounts of domestic coal sources for its generation, and thus will continue to operate in mining until expected depletion of domestic sources around 2025.

Generation

CEZ Group is benefiting from low cost generation fleet (see Figure 20). Coal-fired power plants (46% generation share) are using mostly lignite from CEZ's own mines. Together with very low operational costs of nuclear plants (38%), CEZ has a long-term competitive advantage of low and relatively stable generation costs. At the same time, CEZ generates 95% of its electricity in the Czech Republic, where it represents 72% share (64 TWh) and thus makes CEZ a dominant player on this market.

The generation portfolio remains stable and unchanged for now. In the current situation, it is benefiting from low coal prices and long-term contracts on nuclear fuel supplies. The focus is therefore on optimalization and consolidation of asset base through cost reductions and efficiency increasing in plant operations. The future development of CEZ Group's capacity mainly depends on the decision on new nuclear plants together with gradual decommissioning of black and brown coal-fired power plants due to their old, environment intensive generation and expected depletion of domestic sources.

Figure 20: CEZ Group's installed capacity and generation (2013)



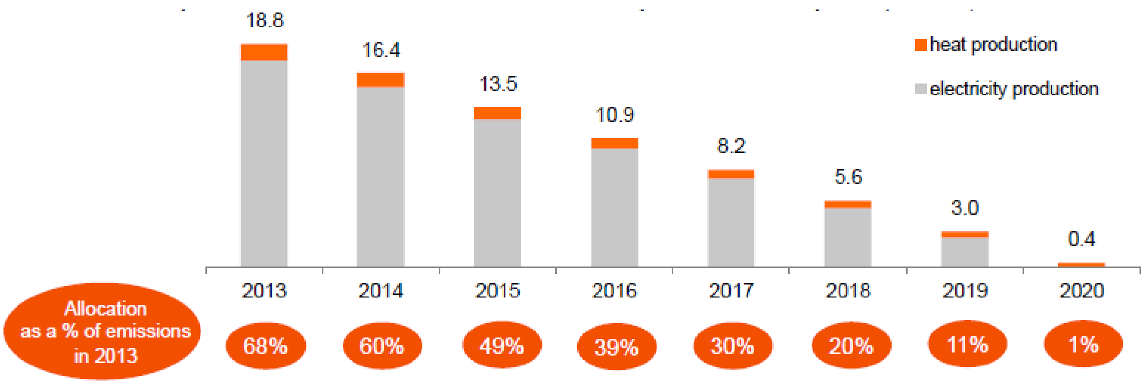
Source: CEZ Group presentation, 2014, s.5

However, new gas-fired power plant Pocerady construction completed in 2012 is still ongoing commissioning, mainly due to very high gas prices that in the current situation would be unprofitable to operate. The planed start of operation is in 2014; nevertheless, it will remain as flexible and reserve source until the situation with prices improves. Yet, its role will be higher and higher due to the rising RES share. Renewable resources are mainly developed outside the Czech Republic, but still remain to have very low capacity and share of overall generation. The planned gradual transaction to RES, particularly towards wind energy, has been put back due to recent regulation and support changes in many countries, such as the Czech Republic, Romania and Poland. (CEZ Group Annual Report 2012, p. 113)

CEZ Group's CO2 intensity is around 0,6 t/MWh, below European price setting plant (emission factor of 0,8 t/MWh). Increase in CO2 price thus has a positive impact on CEZ's profitability. CEZ Group in the Czech Republic obtains part of emission allowances for free with the volume of allocated allowances decreasing over years to zero allocations in 2020. In January 2014, the European Commission made a decision on the 2013 allocation of emission allowances for the electricity and heat generation in the

Czech Republic. On February 2014, CEZ Group was therefore credited with 18,8 million emission allowances for 2013 (see Figure 21).

Figure 21: Expected allocation of allowances for CEZ Group in the Czech Republic (in millions)



Source: CEZ Group presentation, 2014, s.13

So far CEZ Group invested a total of CZK 26,8 billion in projects reducing greenhouse gas emissions in the Czech Republic, and by 2019 plans to invest up to another CZK 42 billion. The Czech Republic's application for emission allowances for electricity production in 2013-2019 was approved by the European Commission already in 2012. In exchange for investments reducing greenhouse gas emissions, Czech energy companies can thus get a total of 107,7 million emission allowances in 2013-2019. CEZ Group can get up to 70,2 million emission allowances in the Czech Republic in 2013-2019.

Distribution, supply and trading

CEZ also controls distribution grids in 5 out of 8 distribution regions in the Czech Republic (mainly northern regions) with 63% of customers. With the liberalized market, CEZ's share of electricity supply decreased to only 37%, while the remaining share is covered by E.ON and many other alternative suppliers. Electricity supplied to consumers by CEZ Group is a combination of electricity generated in own power plants, electricity bought from other independent electricity generator, and electricity bought from independent electricity traders.

Distribution remains very important part of the vertically integrated portfolio allowing the company to be in direct contact with majority of consumers on the market. Mainly due to increasing share of decentralized generation (particularly solar plants), CEZ had to increase capital expenditures for renewal and development of the distribution grid to ensure grid quality, reliability and safety, and automate the management of grid operations. Also, CEZ rolled out a smart distribution grid in 2010 in a selected geographical area for testing, as well as smart electric meters at homes and businesses. This should enable conventional and alternative power sources to be combined effectively in the future. (CEZ Group Annual Report 2013, p. 114)

In order to hedge itself against falling electricity revenues, with focus on value adding segments, and in view of negative scenario perspective, CEZ diversified into new segments through establishing new subsidiaries in the field of electricity and natural gas supply (CEZ Prodej), heating supply (CEZ Teplarenska), small cogeneration units (CEZ Kogenerace), renewable sources (CEZ Obnovitelne zdroje), efficiency services for industries (CEZ Energetic sluzby), efficiency services for small consumers (CEZ Nova energetika), and even mobile phone services (CEZ Mobil).

CEZ is also very active in electricity trading, since the Czech Republic remains net exporter of electricity. There are no bottlenecks on the borders, except for Poland. Total net exports in 2013 were 17,9 TWh (0,3% increase from previous year – Germany 11,6 TWh (34%increase), Austria 2,6 TWh (13% decrease), Slovakia 5,1% (35% decrease), and Poland -1,3TWh (13% decrease). Since electricity markets in the region are integrated, CEZ can sell its power abroad on the wholesale market. It is also profitable since electricity prices for baseload in 2015 for neighboring countries are higher compared to the Czech Republic (35,10 €/MWh) – Germany (36,10 €/MWh), Poland (39,22 €/MWh), Slovakia (35,85 €/MWh), and Hungary (43,00 €/MWh). (CEZ Group Annual Report 2013, p. 101)

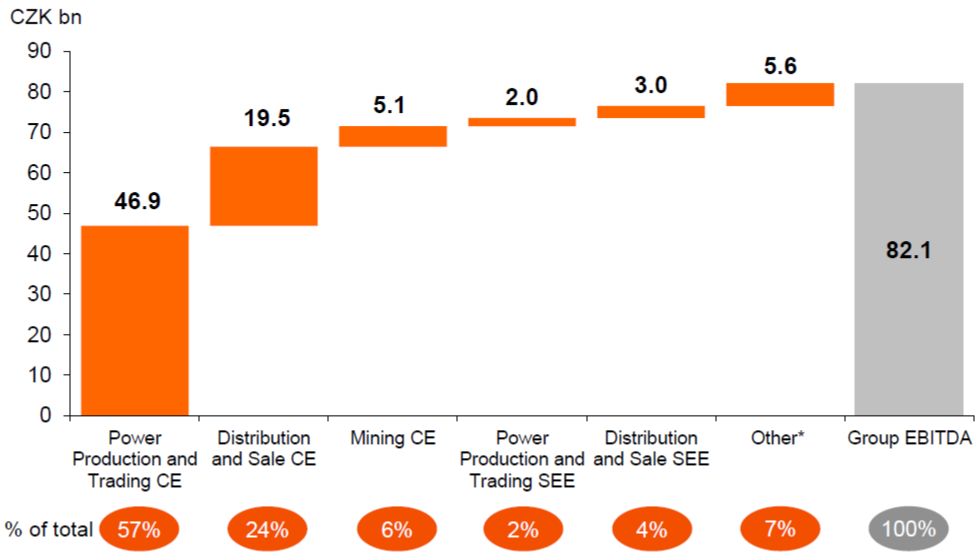
Implications of the ongoing fundamental changes can be seen in some CEZ’s international operations. In particular, increasing end-user electricity prices in the South-east Europe markets, together with social protests and governmental opposition caused CEZ Group to consider targeted departure from high-risk markets. The process has gone furthest in Albania, which unilaterally removed distribution licenses restraining CEZ from further operation there. In May 2013, CEZ officially initialized arbitration against the Albanian Government. Similar problems with high end prices were encountered in Bulgaria and Romania, where the regulatory frameworks changed significantly and caused CEZ further decline in revenues. (CEZ Group Annual Report 2012, p. 95)

Value chain share

In the current business model, the dominant position has generation - 60% of cash flow. Lignite power plants and mines work in symbioses and thus create added value. However, 80% of CEZ's cash flow is therefore sensitive to commodity prices. Almost 25% of cash flow is then formed by distribution services. The end-customer has 5-10% value of cash flow. (similar situation is with EBITDA shares, see Figure 22)

However, the future business model will be much more consumer oriented with the offer of new products and services. In 10 years, the share of end-user value for the company could increase up to 50%, with the rest in generation and distribution. The value chain is slowly shifting from generation towards supply. However, according to Petr Stulc (CEZ Asset Management Director), "it doesn't mean the departure from generation, only its weakening in the value chain position".

Figure 22: Segmental contributions to EBITDA in 2013



Source: CEZ Group presentation, 2014, s.59

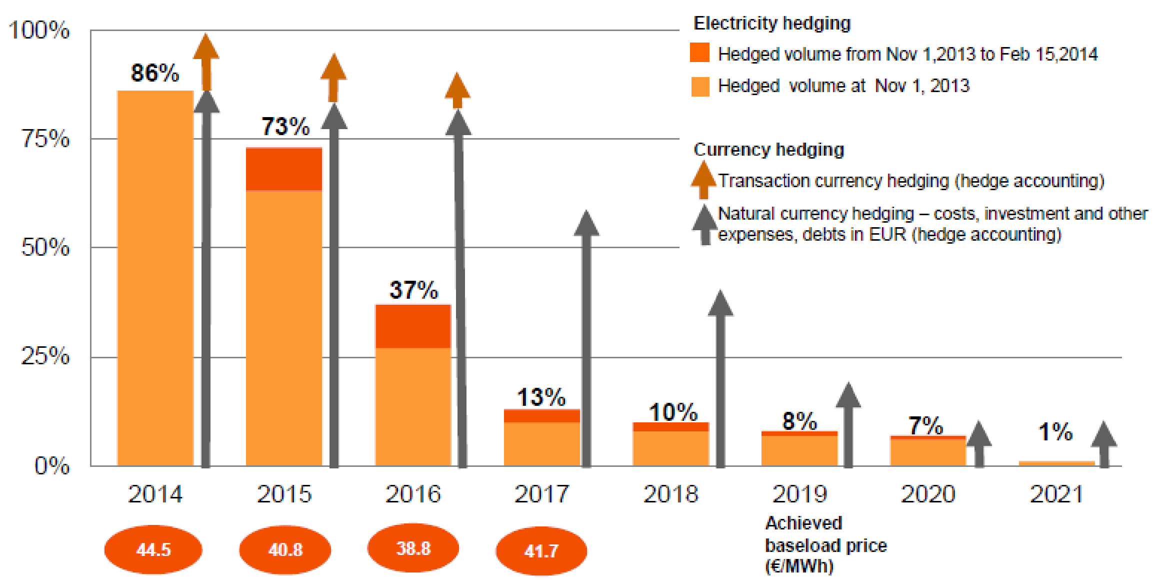
According to Vladimir Hlavinka (CEZ Board of Director Member), the fundamental change in CEZ's value chain and structure will come only around 2025, when most of the domestic coal will be extracted and coal-fired plants closed down.

He even suggests that the cycle for big conventional power plants will return, since most of the RES build today are operating due to subsidies for the future 10 years, when redemption price and payback period is set. None of the small RES operators, who would be unprofitable without subsidies, puts aside reserves for their renewal. This means that in 5 to 10 years, Europe no longer generously supporting RES will return to big, but more flexible, power plants. At this time, however, it will be inconvenient to build new coal or any other fossil power plants. The electricity system will have to have big and flexible conventional sources to hold the grid, accompanied with supplemental decentralized sources closer to consumer. The preferable source is the nuclear power, where CEZ has a lot of experience and holds competitive advantage.

3.4.2. Group's financial performance

Electricity prices have declined by more than 5 €/MWh in the last 12 months (€41,2 in 03/2013 - €35,7 in 03/2014). The decline in electricity prices was driven mainly by declining coal prices (decline from 102 to 80 USD/t). Therefore, CEZ continues hedging its revenues from sales of electricity in line with standard policy of majority hedged generation with higher prices (see Figure 23).

Figure 23: Share of hedged generation from CEZ power plants (as of 02/2014, 100% corresponds to 57-59 TWh)



Source: CEZ Group presentation, 2014, s.11

Mainly due to the trend of declining wholesale electricity prices, together with difficulties in markets such as Bulgaria, Romania and Albania; CEZ Group's EBITDA, EBIT and

Net Income are continuously decreasing since 2008. With the trend continuing in 2014, expected EBITDA is CZK 70,5 billion and net income is CZK 27,5 billion (see Figure 24, for more detailed historical financial see Appendix 1).

Figure 24: Selected historical financials of CEZ Group

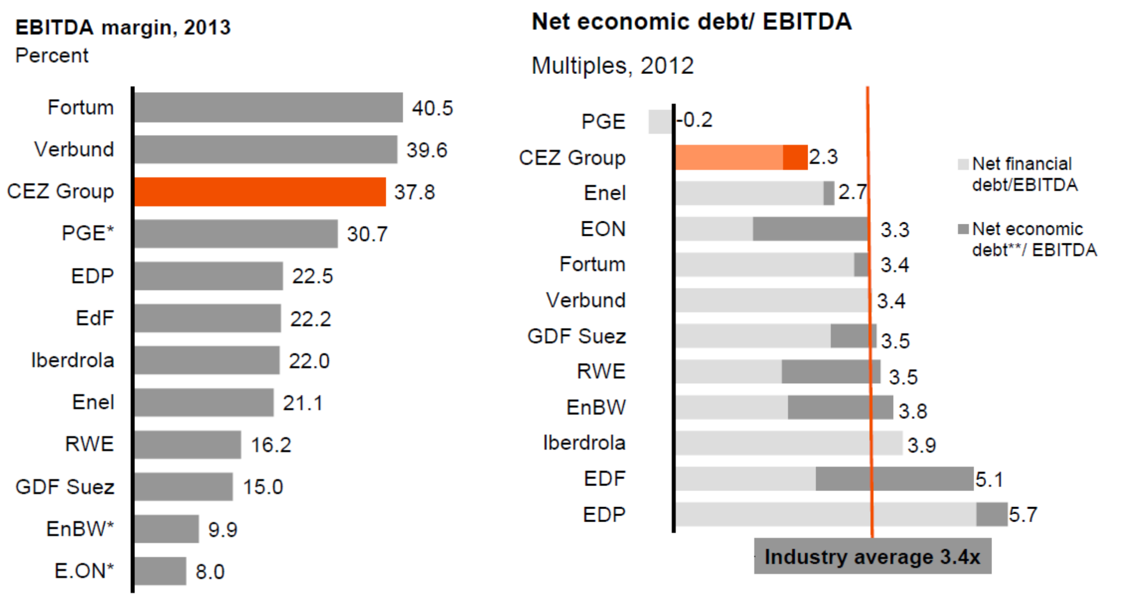
CZK bn	2008	2009	2010	2011	2012	2013
EBITDA	88.7	91.0	88.8	87.4	85.8	82.1
EBITDA margin	*48%*	*46%*	*45%*	*42%*	*40%*	*38%*
EBIT	66.7	64.9	62.0	61.3	57.1	45.8
EBIT margin	*36%*	*33%*	*31%*	*29%*	*27%*	*21%*
Net Income	47.4	51.9	46.9	40.8	40.2	35.2
Net income margin	*26%*	*26%*	*24%*	*19%*	*19%*	*16%*

Source: CEZ Group presentation, 2014, s.60

From 2010 to 2013, leading European utilities recognized impairment allowances and write-offs on 3–16% of their fixed assets. In the case of CEZ Group, the figure was just 2.7%. (CEZ Group Annual Report 2013, p. 10)

At the same time, CEZ Group continues to be one of the most profitable European utilities with EBITDA margin of 37,8% in 2013 (3rd best result). Current level of debt is also low compared to the industry standards, giving CEZ a comfortable position in the current environment and strong position of liquidity - Net Debt/EBITDA ration is at 2.0-2.5x level. (see Figure 25)

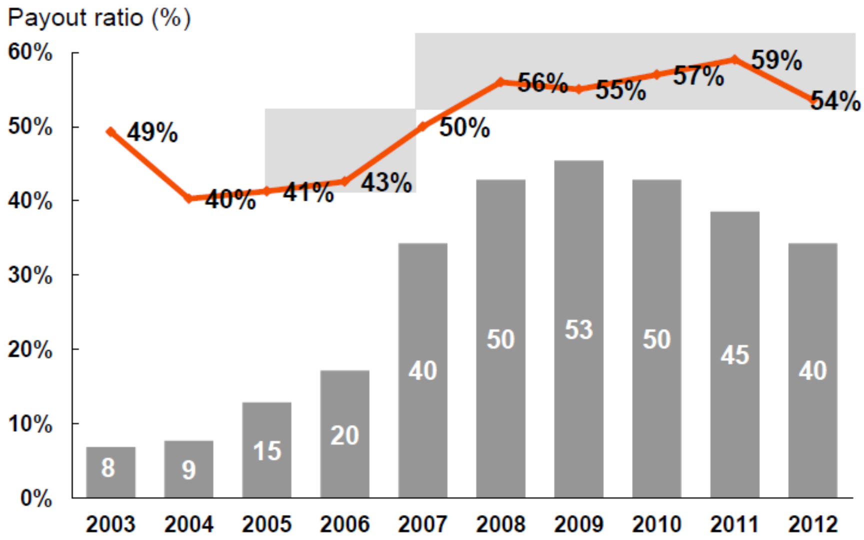
Figure 25: EBITDA margin (2013) and Net Debt/EBITDA ratio (2012)



Source: CEZ Group presentation, 2014, s.6 and 32

Despite current market challenges, CEZ Group is committed to maintain its payout ratio of 50-60% of the consolidated profit adjusted for extraordinary items – one of the highest in the industry (see Figure 26).

Figure 26: Development of CEZ Group's dividend payout ratio



Source: CEZ Group presentation, 2014, s.33

The Company's overall financial stability, strong liquidity position, and investor trust is also attested to by the successful placement of a CZK 1 billion, USD-denominated bond issue in the American market in 2012. This was the first ever corporate issue in the U.S. Dollar market not just in the Czech Republic, but in the entire region. A portion of the issue (USD 300 million) has a maturity of 30 years, making it the issue with the longest maturity in CEE, and the interest rates achieved are close to the levels commanded by the highest-rated Western European utilities. (CEZ Group Annual Report 2012, p. 11)

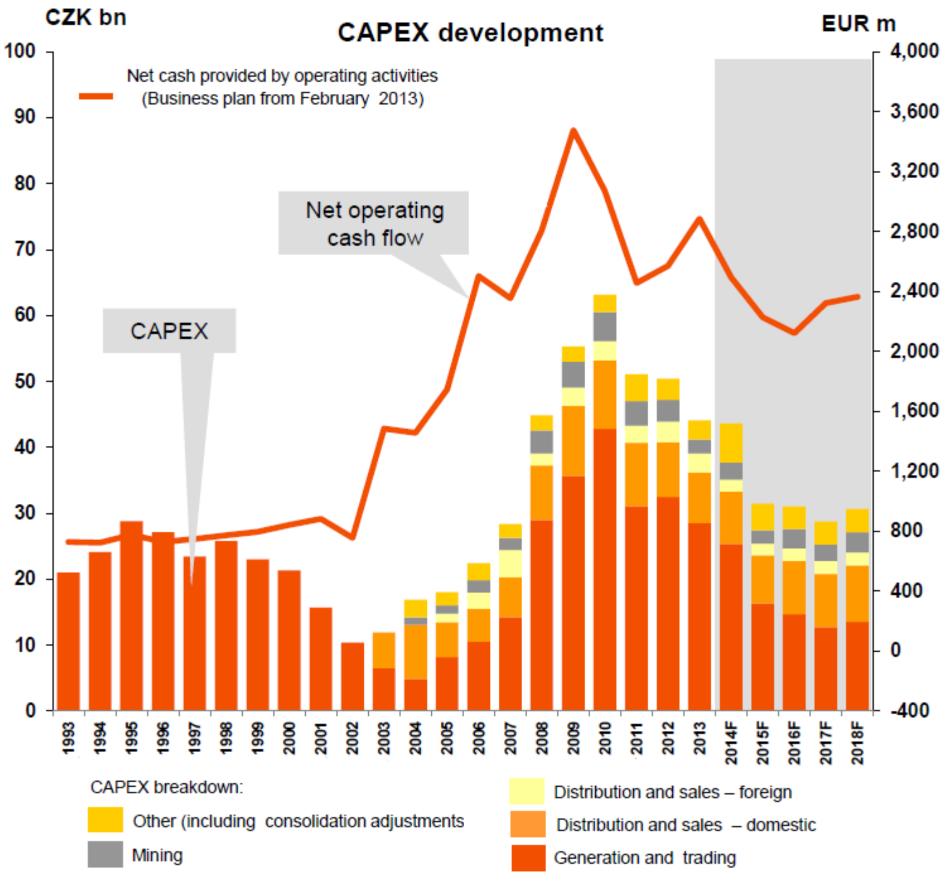
Also, CEZ Group is handling the European power industry crisis better than its competition in terms of financial stability, as well. As one of few European utilities, CEZ have managed to keep its indebtedness within prudent limits, and this is confirmed by credit rating of from Standard & Poor's, which remains at A– with stable outlook, its highest level ever.

CEZ accomplished this not only by leveraging competitive generation portfolio, but also through timely identification of threats, active implementation of measures, and, in particular, ongoing adaptation of growth strategy to its financial means in accordance with its conservative financing policy. CEZ is responding to energy market turbulence primarily by optimizing its portfolio, putting emphasis on internal efficiency, and developing new growth opportunities.

Investments

Even though that the level of investments is gradually decreasing, CAPEX plan can be financed from operating cash flow (see Figure 27). Key future projects involve upgrades of coal-fired plants, construction of gas-fired plants, construction of Romanian and Polish wind farm, and preparatory CAPEX for nuclear power plant expansion.

Figure 27: CEZ Group's CAPEX development



Source: CEZ Group presentation, 2014, s.31

However, most of the projects have been planned for a long time and new investments have been almost stopped. Nevertheless, "since energy sector is cyclical, big investments should return around 2020", says Vladimir Hlavinka (CEZ Board of Director Member).

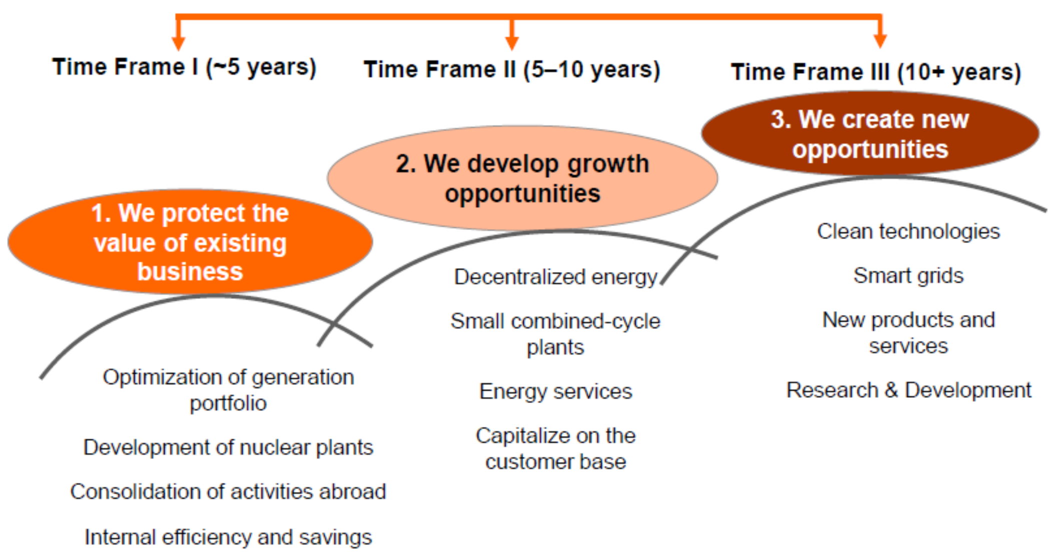
3.4.3. Group's strategy

In response to unfavorable economic developments and the deteriorating business environment in Europe, over the past few years CEZ has undertaken a number of countermeasures aiming to stabilize and mitigate CEZ Group's risk profile. Strategies with a number of scenario predicting future developments in the sector were prepared. Today, one of the most negative scenarios is happening.

In view of the persistent risk of further declines in the price of electric power, CEZ is diversifying its asset structure to leverage business opportunities in price-regulated segments. In sales, CEZ fixes its margins by selling larger volumes of electricity several years in advance, as well as through long-term contracts expiring in 2020. CEZ expanded services by developing sales of natural gas and rolling out mobile phone services. On the expenses side, CEZ is emphasizing internal efficiency through initiatives such as the creation of shared service centers in support, distribution, and customer services.

CEZ reacts to turbulent developments in markets with a balanced strategy covering three time frames by protecting the value of existing business in the short run (efficient performance, hedging) developing growth opportunities in the medium run (decentralized generation, RES), and creating new opportunities in the long run (clean tech, smart grids) (see Figure 28).

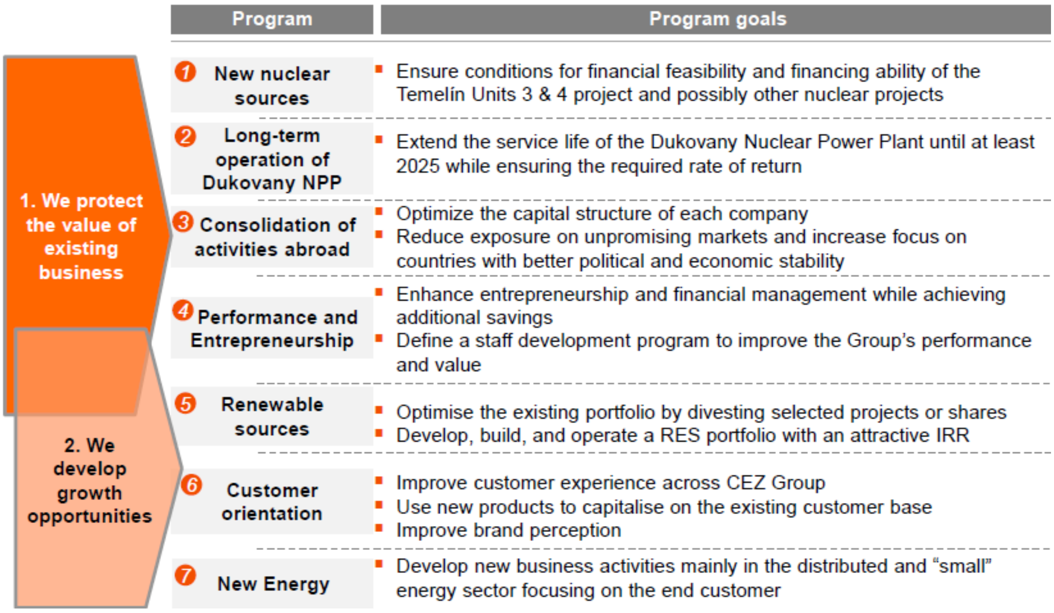
Figure 28: CEZ Group's strategic time frames



Source: CEZ Group presentation, 2014, s.20

The strategy is implemented in seven strategic programs – new nuclear sources at Temelin NPP, long-term operation of Dukovany NPP, consolidation of activities abroad, performance and entrepreneurship, renewable sources, customer orientation and New Energy (see Figure 29).

Figure 29: CEZ Group's seven strategic programs



Source: CEZ Group presentation, 2014, s.21

According to Petr Mikovec (CEZ Business Development Director), especially the last two strategies are important, since the customer's value is increasing, as well as the decentralized generation – both implying the increase and preparation for "prosumers".

1. and 2. program: Nuclear sources

No big changes in the generation portfolio are planned in the medium run, especially since the Czech Republic has unsuitable environment for renewable sources (and financial cost would be huge). At the same time, structural change for the Czech energy sector will be in the continuous decommission of coal-fired power plants, caused by its efficiency and ecological obsolence; at the same time as domestic coal will run out. These plants have to be replaced by accordingly big sources in order to maintain grid stability. Development of CEZ Group's capacity thus depends mainly on the decision on new nuclear plants. (CEZ Interview)

In 2009, a public tender for contraction of two new units at Temelin NPP was launched. However, the EPC Contractor selection procedure will continue, but the final decision on such a major investment in such a turbulent environment will be made only after fulfilling of these two conditions:

- Compliance with the State Energy Policy of the Czech Republic is confirmed
- Conditions allowing acceptable return on investment are secured – CfD or any other way of support mechanism is not confirmed, yet

In April 2014, the procurement procedure has been canceled. This decision was preceded by communication with the Czech government. Given continued discussion about future of electricity sector in the EU, the government currently does not plan to provide guarantees or the stabilization mechanism for construction of low-emission power plants. At the same time it declared its interest in further development of nuclear energy in the Czech Republic and it intends to prepare the complex plan by the end of 2014. (CEZ Group webpage, 2014)

Information was received by all participants – consortium of Westinghouse Electric Company LLC and Westinghouse Electric Czech Republic s.r.o., consortium of ŠKODA JS, Atomstroyexport and Gidropress and also earlier excluded AREVA NP.

4. program: Shared service centers

CEZ is achieving the planned cost cuts (CZK 0,5 billion annually) and simplifying the system of support services in the Czech Republic by creating shared service centers:

- CEZ Customer Services (Plzen) – external customers services
- CEZ Distribution Services (Hradec Kralove) – providing network services
- CEZ Corporate Services (Ostrava) – facility management, Accounting, HR

5. program: Renewable resources

RES in the Czech environment can only be considered as a supplemental to conventional sources. Therefore, CEZ Group considers a construction of new RES entirely in other EU countries (Romania, Poland, Bulgaria, Germany), where there is incomparably better environment and thus economic conditions for such sources. Nevertheless, RES projects are consolidated, and only projects with attractive IRR are being developed.

6. program: Customer Orientation

CEZ Group's main products in the Czech Republic were electricity and heat supply. Since 2009, CEZ also became an alternative gas supplier (in 2013, with approximately 300 thousand customers, gas supplies generated around CZK 1,1 billion of CEZ's gross margin). Since 2013, CEZ also offers mobile phone services (by the end of 2013 with approximately 40 thousand customers). CEZ would like to continue to exploit unique access to its customer base by further financial services and assistance services.

7. program: New Energy

CEZ is already through its subsidiaries active in some areas that are considered as new energy. In 2013, CEZ set up a new company CEZ New Energy specializing on finding growth potentials in decentralized energy sector. This new subsidiary should invest in companies in predefined sectors that would allow gaining competitive advantages in future clean tech environment (see Figure 30).

Figure 30: New Energy growth opportunities

	Theme	Examples of opportunities	CEZ Group´s existing competence
	Services for households and service sector	▪ Services relating to the energy management of buildings ▪ Sale, installation and service of heat pumps, LED lighting, household smart grids.	CEZ Energetické služby – services, audits and consultancy concerning energy management and energy savings
	Professional services for industry and municipalities	▪ Technically demanding services and products such as installation and operation of industry islands or design and installation of local DC grids	CEZ Energetické služby – energy projects and wide range of services for industrial customers
	Regional decentralised energy production	▪ Installation and operation of micro-cogeneration ▪ Construction and operation of regional waste-to-energy plants	CEZ Energo – realised several projects concerning construction and subsequent operation of gas-fired cogeneration units
	Enter to other network industries	• Construction and operation of public lighting	CEZ Energetické služby – operates public lighting in several municipalities

Source: CEZ Group presentation, 2014, s.26

Opportunities for adding value business projects can be seen in seven subsectors – services for households and service sector, specialized services for the industry and municipalities, other networks, E-mobility, regional decentralized generation, optimizing of current assets and activities, and leveraging the customer base.

Summary

CEZ Group is a dominant utility operating in Central and South-eastern European countries, one of the TOP10 European energy companies in terms of customers and market capitalization. CEZ is leader in the Czech electricity market with a vertically integrated portfolio of activities and subsidiaries in lignite mining, power and heat generation, power and heat distribution and power, heat and gas supply.

The research showed that the dominant position in CEZ's value chain has low cost generation fleet (coal, nuclear) - 60% of cash flow. Lignite power plants and mines work in symbioses and thus create added value. However, 80% of CEZ's cash flow is therefore sensitive to commodity prices. Almost 25% of cash flow is then formed by distribution services. The end-customer has 5-10% value of cash flow.

In the current situation, low coal prices are bad for mining and good for generation. At the same time, CEZ obtains a part of emission allowances for free, which given the share of generation in value chain is providing the company with advantage. As the wholesale electricity price decreases, so does CEZ's EBITDA. Nevertheless, the financial performance compared to competition remains good and CEZ is one of the most profitable companies with stable dividend payout ratio (50-60%) and credit rating (A-).

However, the future business model is expected to be much more consumer oriented. In 10 years, the share of end-user value for the company could increase up to 50%, with the rest in generation and distribution. Thus, the value chain is slowly shifting from generation towards supply. CEZ reacts to turbulent developments in markets with a balanced strategy covering three time frames. With the negative future scenario in mind, CEZ is hedging majority of its generated electricity, consolidating activities and optimizing current assets, increasing efficiency and performance, and is cutting down investments. Investments into RES are mainly focused outside the Czech Republic. Development of nuclear energy mainly depends on the Czech government support and is currently stopped.

Among the seven strategic programs, focus on customer and new energy have priority. Portfolio of provided products and services was diversified into gas supply and mobile phone services. Newly established subsidy New Energy has the task to identify opportunities and pick projects adding value to the group in decentralized generation, services for households, industry, and municipalities, other network industries, and e-mobility.

4. DISCUSSION OF FINDINGS

Value chains are important part of any business strategy, since they are a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. Especially the energy market is specific by its huge corporations with many subsidies often operating along the whole electricity value chain – fuel, generation, transmission, distribution, and supply – either in regulated or liberalized markets (or mixture of both).

In the traditional power utility business model, companies are delivering from a mix of generation, distribution and retailing activities across centralized grids. Companies have been used to high investment credit ratings enabling them to develop capital-intensive asset base with predictable long-term cost of recovery from a mix of regulated and unregulated returns.

The European energy industry is going through a difficult period and has become a sector where words like “security”, “stability”, and “simple rules” may no longer apply. The utilities and energy companies that build, maintain, and operate the world’s electric power systems must respond to a number of critical challenges and opportunities, ranging from resource constraints and environmental strictures, to more proactive consumers and potentially disruptive technologies in the form of decentralized generation.

Nearly all big European utilities are under a lot of pressure as they face a number of common factors, most of them unfavorable. These factors go far beyond the prolonged debt crisis in the European Union and the related sluggishness in the economies of most European countries. They are now being joined by growing regulatory interventions at both the pan-European and national levels, in the form of massive growth in subsidized renewable power sources, shifts in the stance on nuclear energy in major European Union countries, a fading emission rights system, and substantial declines in the prices of energy commodities, especially coal, reflecting in particular growth in shale gas extraction in the USA.

Together, higher supply caused by extra decentralized generation with lower demand caused by the crises and efficiency measures, these factors are bringing about a long-term decline in wholesale electric power prices, which are currently at levels last seen in 2006, and limiting the resources and risking future investments into needed conventional sources. Low wholesale prices also have implications in declining value of the energy companies, connected with declining of their investment role.

Subsidized renewables are bringing about a raise in retail electric power prices, caused mainly by the generous subsidies payments that are transferred down onto consumers. At the same time, decentralized sources with their intermittent generation are causing trouble to electricity grids that have trouble balancing the system, and conventional dispatchable power plants that often have to be turned down or even shut down (mainly gas-fired ones), since the electricity generated with the lowest variable cost (RES) has a grid priority.

While the electricity infrastructure that underpinned much of the economic and social development of the 20th Century continues to perform its original functions well, there is widespread consensus that it must be fundamentally transformed in order to meet the needs of the 21st Century. Those needs above all represent technology developments that allow energy efficiency improvements, falling solar prices that make viable and spread decentralized generation, demand side management of active prosumers, battery storage systems, all together connected with smart grid technologies. Traditional energy companies have to adjust their value chains to those conditions if they want to continue to play their current role.

The research showed that companies today are reacting by hedging, cost reductions and efficiency improvements that can buy utilities considerable defensive headroom in responding to the changes. However, two key elements in this transformation will be a strategic view on just how far and at what pace distributed energy will take hold of the market. Strategies that are most likely to succeed in a more decentralized power landscape with active prosumers involve services to provide distributed energy, help consumers save energy, become a rather partner than supplier, diversify to new markets by using the existing consumer power.

Since energy is one of the shared competencies, European energy sector is highly influenced by the EU energy policy with its three main goals of energy competitiveness, sustainability and security of supply. Tools to ensure such goals include liberalization, unbundling and integration of energy markets for the competitiveness, as well as EU Emission Trading System and RES subsidy mechanisms to promote sustainability.

Still, many suggest that regulation is facing something of a crisis, since they have trouble of grappling the big issues of supply availability, affordability and environmental impact during current changes. The issue of what policy design features are needed to enable system operators to balance a system with high levels of intermittent generation is an urgent one. Capacity mechanisms, that would incentivize gas-fired plants to remain online and prevent more plants being shut down, are one answer to this. They are step into more regulated business environment, where utilities are paid to serve as a capacity provider. However, they don't remove the investment uncertainty. Measures, such as demand response, demand side management and other market based instruments to secure long term payback period, should be introduced to balance intermittent generation.

European utilities agree that any capacity payments should be all-European, since individual member state solutions would disrupt the liberalized market. At the same time, utilities believe that two instruments to promote RES are contradicting each other. Only reformed EU ETS should remain to set socially acceptable level of emissions. No RES subsidies would bring stability into investment decision-making and set a fair ground to all generating sources.

Central European region is specific by its north-south imbalance in electricity generation, where northern countries (Germany, Poland and the Czech Republic) have surplus of power, compared to southern countries (Austria, Slovakia, Hungary) having a deficit of power. This has implications for the highly interconnected Czech grid that is situated in the middle and has to balance the increasing generation from intermittent sources in the region. The situation will get worse, since especially Germany is expected to increase RES generation due to withdrawal from nuclear power.

Czech electricity market is an integral part of wider European electricity market, fully liberalized since 2006. Czech Republic remains net exporter of electricity and enjoys high level of electricity independence (70%), since majority is generated from domestic sources, especially coal. At the same time, Czech Republic doesn't have favorable environment conditions for renewables and that is why it prefers to focus on nuclear energy, which has a long tradition.

4.1. Implications of changes on CEZ Group's value chain and structure

CEZ Group is a dominant utility operating in Central and South-eastern European countries, one of the TOP10 European energy companies in terms of customers and market capitalization. CEZ is leader in the Czech electricity market with a vertically integrated portfolio of activities and subsidiaries in lignite mining, power and heat generation, power and heat distribution and power, heat and gas supply.

How is the company dealing with the problem?

CEZ Group is a vertically integrated company alongside the whole traditional electricity value chain. Research shows that utilities are affected by current changes differently depending above all on their generation mix and government policy. CEZ Group was ready for such a negative scenario in time and is not affected as much as the competition. The implications of current changes on the value chain and structure of the company are seen in the form of preparing for the future business model – mainly customer oriented with decentralized generation. The transformation of current business model has started, but it is a long term process with continuous adjusting. For the Czech Republic and hence for CEZ Group, the fundamental change and true test of success will come only around 2025, when most of the domestic coal will be mined and coal-fired plants closed down. So far, CEZ is doing maximum to face the future business model well prepared.

How is company's value chain reacting to the changes?

The research showed that the dominant position in CEZ's value chain has low cost generation fleet (coal, nuclear) - 60% of cash flow. Lignite power plants and mines work in symbioses and thus create added value. However, 80% of CEZ's cash flow is therefore sensitive to commodity prices. Almost 25% of cash flow is then formed by distribution services. The end-customer has 5-10% value of cash flow.

In the current situation, low coal prices are bad for mining and good for generation. At the same time, CEZ obtains a part of emission allowances for free, which given the share of generation in value chain is providing the company with advantage. As the wholesale electricity price decreases, so does CEZ's EBITDA. Nevertheless, the financial performance compared to competition remains good and CEZ is one of the most profitable companies with stable dividend payout ratio (50-60%) and credit rating (A-).

However, the future business model is expected to be much more consumer oriented. In 10 years, the share of end-user value for the company could increase up to 50%, with the rest in generation and distribution. Thus, the value chain is slowly shifting from generation towards supply. CEZ reacts to turbulent developments in markets with a balanced strategy covering three time frames and gradual establishment of new consumer oriented subsidiaries. With the negative future scenario in mind, CEZ is hedging majority of its generated electricity, consolidating activities and optimizing current assets, increasing efficiency and performance, and is cutting down investments. Investments into RES are mainly focused outside the Czech Republic, but due to regulatory changes in support decreased to minimal level.

Development of nuclear energy mainly depends on the Czech government support and is currently stopped due to very low end-user electricity prices and unpredictable future developments without state guarantee. Influence of the changes could be seen in ongoing commissioning of gas-fired power plant Pocerady, which due to high natural gas prices does not fully operate but serves only as a flexible and reserve source. CEZ is also influenced by the great amounts of intermittent generation (particularly solar power), and thus invests into the stability of is distribution grids. Smart grids have also been deployed for testing.

Perhaps, the biggest influence of the changes affected CEZS international operations in some South-eastern European markets. In particular, due to high end-user electricity prices, social protests and governmental opposition, CEZ had to leave the Albanian market. Similar problems are now developing in Bulgaria and Romania, where regulatory framework changed rapidly and added to decrease in revenues.

Among the seven strategic programs, focus on customer and new energy have priority. Portfolio of provided products and services was diversified into gas supply and mobile phone services. Newly established subsidy New Energy has the task to identify opportunities and pick projects adding value to the group in decentralized generation, services for households, industry, and municipalities, other network industries, and e-mobility.

CONCLUSION

Major findings and contribution of the research

The master thesis research describes the fundamental changes in the European energy sector and analyses implications it has for the value chain of the Czech electricity company - CEZ Group. The main drivers of the change could be characterized as falling commodity prices, vast RES support, and decentralized generation. Those triggers have implications for the functioning of the traditional energy business model. Wholesale electricity prices are decreasing and become insufficient for future investments. At the same time, due to RES support, retail electricity prices are on contrary increasing and causing opposition of the public. Grid stability is further threatened by the sudden and vast deployment of intermittent sources. Therefore company value is decreasing and losing its investment role. Such changes lead to the transformation of business model into more decentralized one with active consumers connected with new technologies, such as smart grids.

The research showed that companies today are reacting by hedging, cost reductions and efficiency improvements that can buy utilities considerable defensive headroom in responding to the changes. However, a significant change for the value chain will be the orientation on consumers, since they are becoming more active via decentralized generation. Thus, new services for prosumers are the key task for the future.

Furthermore, this thesis provides various existing instruments that are used by the European Union and the state in the energy sector, especially liberalization and integration of markets. EU Emission Trading System and national RES subsidies systems then actively contribute to the current situation. Therefore, future instruments and regulatory interventions, such as capacity mechanisms, demand-side management, are needed in order for the European Energy Policy to further achieve its core goals of energy competitiveness, sustainability and security of supply. Nevertheless, a common opinion is shared, that capacity payments should only be applied on all-European level, RES subsidy canceled or minimized and EU ETS reformed. Moreover, specifics of the Central European and Czech electricity markets, alongside with company analyses, including value chain, financial, strategy analyses, are needed to fully assess the extent of implications the fundamental changes are causing to the value chain of CEZ Group.

CEZ Group is a vertically integrated company alongside the whole traditional electricity value chain. Research shows that utilities are affected by current changes differently depending above all on their generation mix and government policy. CEZ Group was ready for such a negative scenario in time and is not affected as much as the competition. The implications of current changes on the value chain and structure of the company are seen in the form of preparing for the future business model – mainly customer oriented with decentralized generation. The transformation of current business model has started, but it is a long term process with continuous adjusting. For the Czech Republic and hence for CEZ Group, the fundamental change and true test of success will come only around 2025, when most of the domestic coal will be mined and coal-fired plants closed down. So far, CEZ is doing maximum to face the future business model well prepared.

Limitation and proposition for future research

The presented study of how fundamental changes in the European energy sector implicates on the value chain and structure of Czech electricity company is due to its topicality very new and still has a lot of space for further research. Recent studies showed that there are some general assumptions about the drivers of the fundamental changes. However, due to high uncertainty in the field, it is difficult to predict future developments and thus assess the full extent of implications that such changes can bring. Even though some interesting findings were observed, the research probably generates more questions, than answered. As a result, there is a vast field for further researches in both theoretical and practical areas.

As a main limitations to this research served two things: only general value chain analyses was described and only one energy company was studied. Thus, it would be appropriate to provide some similar empirical researches not only within the general strategic value chain framework, but also in other specific management areas, to reflect implications of the changes in specific business areas of energy companies. The research could also be done not only within one company, but also include other similar European energy players - comparative study would also be an interesting topic to examine.

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APPENDIXES

Appendix 1: Selected financial indicators of CEZ Group

Selected Indicators of CEZ Group in Accordance with IFRS

	Unit	2009	2010	2011	2012	2013	Index 2013/2012 (%)
Installed capacity	MW	14,395	15,018	15,122	15,781	15,199	96.3
Electricity generated (gross)	GWh	65,344	68,433	69,209	68,832	66,709	96.9
Electricity sold [1]	GWh	43,817	44,594	42,846	41,867	36,593	87.4
Heat sold [1]	TJ	13,040	16,918	15,249	19,467	25,176	129.3
Gas sold [1]	GWh	–	–	3,514	5,895	5,868	99.5
Work force head count as at December 31	persons	32,985	32,627	31,420	31,308	26,647	85.1
Operating revenues	CZK millions	196,352	198,848	209,761	215,095	217,273	101.0
of which: sales of electricity	CZK millions	173,494	175,277	181,793	186,797	189,657	101.5
EBITDA	CZK millions	91,005	88,800	87,350	85,818	82,054	95.6
EBIT	CZK millions	64,936	61,962	61,250	57,083	45,755	80.2
Net income	CZK millions	51,855	46,941	40,753	40,153	35,234	87.7
Earnings per share – basic	CZK/share	96.7	88.1	76.3	77.6	67.2	86.6
Dividend per share (gross) [2]	CZK/share	50.0	53.0	50.0	45.0	40.0	88.9
Net cash provided by operating activities	CZK millions	87,354	77,165	61,773	64,612	72,556	112.3
Capital expenditure (CAPEX) [3]	CZK millions	(56,622)	(61,715)	(51,113)	(50,449)	(44,070)	87.4
Investments [4]	CZK millions	(38,075) [5]	(11,128) [6]	(927)	(5,323)	(962)	18.1
Total assets	CZK millions	530,259	544,375	598,301	636,070	641,136	100.8
of which: property, plant and equipment [7]	CZK millions	328,805	362,510	386,837	419,754	426,560	101.6
Equity (including non-controlling interests)	CZK millions	206,675	227,052	232,190	254,219	263,125	103.5
Net debt	CZK millions	124,062	134,137	156,197	161,028	156,511	97.2
Return on Invested Capital (ROIC)	%	16.0	13.8	12.5	10.5	7.8	74.5
Return on Equity, net (ROE)	%	27.6	22.3	18.2	17.4	14.1	81.0
Net debt / EBITDA	1	1.36	1.51	1.79	1.88	1.91	101.6

[1] Sales to end customers (outside CEZ Group).
[2] Approved in the given year; paid out of the previous year's income.
[3] Additions to property, plant and equipment and intangibles.
[4] Acquisition of subsidiaries, associates and joint-ventures, net of cash acquired.
[5] Including investment in Pražská teplárenská.
[6] Including investment in Dalkia Česká republika.
[7] Property, plant and equipment (including nuclear fuel and construction work in progress).

The composition of EBIT and EBITDA has changed in comparison to the presentation in previous years. In 2013, EBIT and EBITDA do not include impairment of property, plant and equipment or proceeds from sale of property, plant and equipment. The figures for previous years have been adjusted accordingly.

Appendix 2: Interview guide

Introduction (5 minutes)

- What is your name and position in the company?
- How long have you been working for the company?
- Shortly describe your main tasks.

Fundamental Changes in Europe (10 minutes)

- Do you expect the power utility business model to be transformed?
- What are the main triggers and elements of the change?
- Cooperation with MPO, ERU, EU? Is regulation facing crises?

How changes influence the value chain and structure (15 minutes)

- Could you shortly describe the value chain of the company?
- What is the market position of CEZ in each part of the value chain? (main, weak, strong parts)
- What concrete effects or implications does the company experience? (examples)
- Are the value chain and structure already changing? How?
- How do you see the future value chain of the company? (vertic/horiz integration, new services)

How does the company deal with current market changes (15 minutes)

- What concrete steps or changes does the company undertake to fight it? (examples)
- How do changes influence investments? (Pocerady, Temelin)
- How is the portfolio changing? (RES, gas-fired)
- How is state (as an owner) reacting to such changes?

Long term implications for the company (10 minutes)

- How would you characterize future models?
- Will the boundaries of the sector change as business model evolves?
- What will be the strategic choices that companies will have to face up?
- Do you prefer European or member state solution?
- Future mechanisms? (RES support, Capacity payments)

Thank you for your time!