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Abstract

Today's European utilities not only focus on electricity supply, but also offer exchange-traded "structured products" or portfolio management for unbundling financial and physical risk positions. Many utilities are only able to provide these services inside of their home markets, but in the globalized economy, the need for a centrally organized pan-European portfolio management has arisen. In this paper, we analyze the problems to be overcome for establishing a European-wide bundling of electricity contracts. For this purpose, a case study based on the business perspective of RWE Supply & Trading in Central and Eastern Europe is carried out.

Key words: Portfolio management, Risk management, Electricity market liberalization

JEL Classification: L53, L94;

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1 Introduction

In the past, the electricity supply industry was organized in the form of vertically integrated and often state-owned monopolies. The growing ideological, political and economic disapproval of vertically integrated monopolies, and especially the liberalization successes in other network industries, have led to liberalization initiatives in the European electricity industry. Vertically integrated utilities have been separated or unbundled, and barriers to entry in generation and supply are being removed to create competition, which is seen as a means to increase the competitiveness of the electricity industry and economic welfare (e.g. Newbery, 2001).

In a liberalized market, the reliable supply of electricity is the result of a bundle of tasks performed and services provided by different players. Well-functioning markets are therefore a critical success factor for the liberalization process. In many cases, this has triggered the public support for governments to create mandatory wholesale markets, so-called "power pools", as for example in England (Littlechild, 2001). Vertically integrated utilities used a pool system to enable a better technical dispatch, thus minimizing generation costs and taking into account network constraints.

The liberalization of the electricity markets in the European Union (EU) has been a top-down process driven by the directives of the European Parliament and of the Council. More specifically, Directive 96/92/EC (1996) and Directive 2003/54/EC (2003) outline the general conditions that should be in place to assure the creation of a single internal electricity market in Europe, but refrain from designing a concrete market. Given this freedom, most European countries have chosen to keep centralized components to a minimum and to leave market organization to the dynamics of private initiative (see e.g. Meeus et al., 2005, for a discussion of the market architecture and Finon and Romano, 2009 for a description of the price determination mechanisms).

The European Commission regularly monitors the progress of market liberalization (CEC, 2009a). In many parts of the European Union, the liberalization process has still not been properly implemented. To accelerate and better coordinate the process, the European Parliament passed another treaty in April 2009 – the so-called 3rd legislative energy package – which updates and/or replaces former directives (see CEC, 2009b-f). As the processes are fairly similar, these documents combine the development of internal markets for electricity and gas. In the present study the focus is on the electricity sector only, i.e. we leave the gas sector for future research.

One of the key aspects of the 3rd legislative energy package is the extension of cross-country cooperation through increased market coupling capacities, which will eventually lead to a more intensive cross-border exchange of electricity. This market merger offers huge opportunities for the previously nationally orientated utility companies to expand their business. In contrast, it also poses the threat of increased competition in the home market. In order to profit from the development, a company has to be present throughout Europe and be able to offer innovative services and products to its customers, who might also operate in globalized markets. As a consequence, the existing product range has to be adjusted and updated regularly. As the impact of competition induced by the liberalization process both on the electricity generation portfolio and the energy mix (see e.g. Szabó and Jäger-Waldau, 2008) has already been discussed to some extent, the focus of the present work is on the adaptation of a utility's product range to the new legislative environment and market opportunities.

Nowadays, this product range not only consists of electricity supply, but also includes structured procurement, portfolio management or financial hedging services to allow the customer to distinguish between physical and financial risk positions. The importance of this shift of perspective from pure energy supply to a combination of physical delivery and financial risk management has just recently become dramatically evident in the context of the global economic crisis, as the utilities had to face shortfalls in payments due to customer insolvencies.

In contrast, customers who, for example, signed a full supply contract just before the financial and economic crisis were not able to exploit the dropped prices for electricity and gas, thereby missing the opportunity to reduce their energy costs significantly. One way for the customer to reduce exposure to price volatilities is the energy supply through so-called "structured products" that are traded at the energy exchange. An even more sophisticated way to optimize a customer's energy supply is the service of portfolio management, where a wide range of advanced financial and physical products, as well as time flexibility, is used to ensure an optimal trade-off between energy supply, cost and risk.

Today, the RWE Key Account department as the sales interface to major customers is able to provide these services inside of Germany and, in a slightly reduced form, also in Austria. As the representative major customer originates from energy-intensive industries and actively participates in the globalized economy, the need for a centrally organized pan-European portfolio management has arisen.

In this paper, we analyze the problems and obstacles that have to be overcome for establishing a European-wide bundling of electricity contracts. In addition, we investigate the market opportunities arising from such an approach both from the utility's and the customer's point of view.

The organization of this paper is as follows. In section 2, the risks that have to be managed in the new economic environment, as well as the risk management implemented at RWE, are analyzed. The customer's needs and expectations are detailed and tied to specific criteria, in order to state the requirements for a pan-European energy portfolio management in section 4. Based on these prerequisites, RWE's situation in Europe is analyzed, so that in a last step a concept that allows meeting customers' demands can be developed. In order to illustrate the implications, a case study which is based on two specific customers is carried out. The case study contains a breakdown of the steps necessary to realize the wish for a pan-European portfolio management, while taking into account the different market situations and restrictions. Finally, a conclusion is drawn in chapter 4.

2 Risk Management in the Key Account business

Like other power companies, RWE AG is exposed to risks and therefore submitted to the risk management requirements. As described to some extent in the literature (see e.g. Senior, 1999; Burger et al., 2007; and Vattenfall, 2006), major risks arise from the volatility of the price of commodities and of credit risks in trading, sales and procurement activities. The theory of the risk management process after Dangl and Kopel (2004) and IRM et al. (2003) defines the elements of risk: viz. objectives definition, assessment, treatment (development and implementation of risk management) and monitoring of risks.

Figure 1 (see RWE, 2009) displays how RWE AG has adopted the theoretical concept. The Executive Board of RWE AG defines the risk objectives and has established a risk committee. It is responsible for the management of risks, the rules of which are laid down in a group-wide risk management guideline, and also for the overall assessment phase of the risk management process.

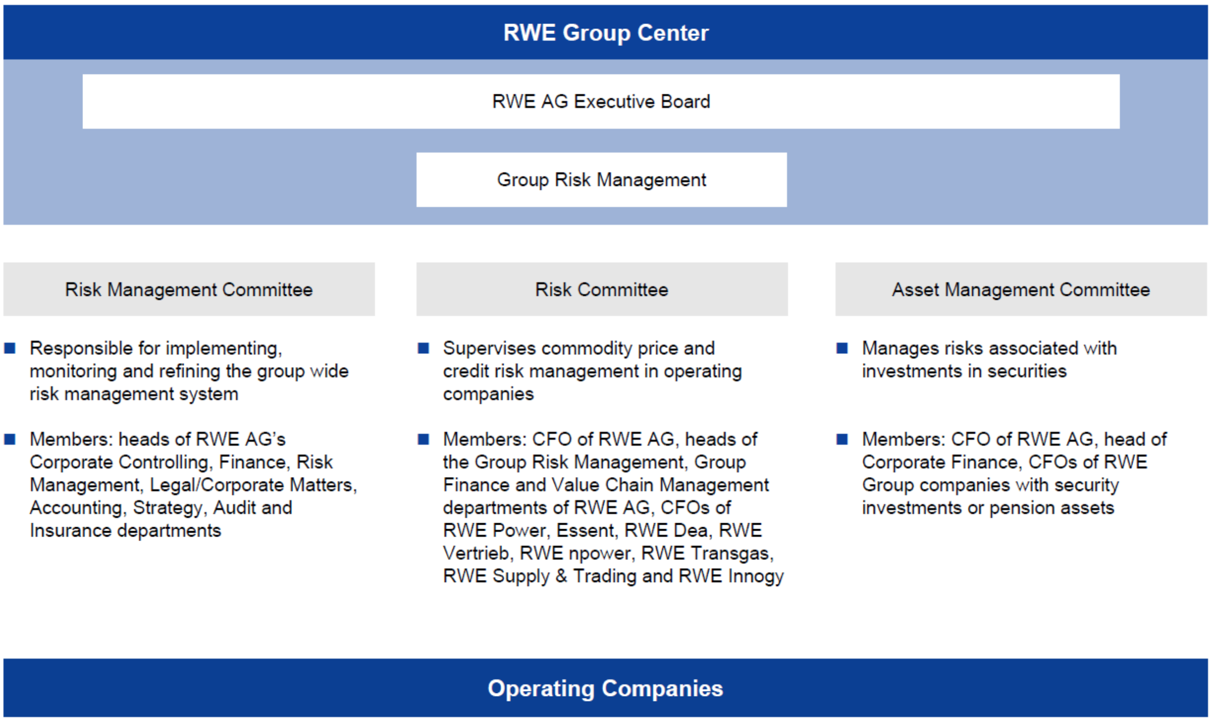


Figure 1: RWE risk management infrastructure
Source: RWE (2009).

The overall assessment phase of the risk management process includes the identification, analysis and valuation of risk. The committee also defines the methods that have to be applied in the individual departments of all RWE divisions, which are responsible for selected tasks of the risk assessment phase. Furthermore, the committee is responsible for the overall monitoring phase of the risk management process. In the theory of risk management, the responsibilities, objectives and the functional implementation of risk management are top-down processes (see Wolf, 2003), which is also the case at RWE AG. Risk management boards are installed on both group and divisional levels. These boards are responsible for the continuous development and implementation of the risk management process. The board of RWE Supply & Trading AG is responsible for the commodity risk controlling of the company and its subsidiaries and has established a commodity risk controlling department as well as defined a general framework; divided into credit risk controlling and market risk controlling, which is mandatory for the commodity risk management department within the key account business. The commodity risk management department reports on a daily basis to the risk department of RWE Supply & Trading AG, and quarterly to the risk department of RWE AG.

According to theory, risk management also requires decisions on how to embed and link operational units in which risks arise to those that control risks (see Wolke, 2007). In the key account department, a separation of responsibilities and competences in the risk management process was realized between the departments in which risks arise, i.e. the key account managing department and those departments which assess and control risks.

In the following, the requirements and options for the realization of a pan-European bundling of electricity contracts is discussed. In the course of the development of a model, the risks involved are identified based on this section’s definitions and findings. In a next step, each risk has to be clearly assigned to a specific contractual partner, so that it can be accounted for when pricing the new product by means of a premium.

3 Development of a Pan-European Portfolio Management

In the previous section, we discussed the importance of risk management, with a focus on utility companies. However, risk management obviously is also an essential part of a customer’s procurement strategy. Therefore, first an introduction to RWE’s key account business is given and the existing range of electricity products reviewed (3.1). Second (3.2), the specific requests of two representative customers are defined and the customers’ situations – e.g. location of production sites – as well as RWE’s products and presence in Europe (3.3) are presented. Finally (3.4), a concept to meet the customers’ demands is developed and detailed for a pragmatic implementation.

3.1 Electricity procurement strategies of industrial customers

RWE Key Account GmbH – founded in April 2005 – has recently been integrated into RWE Supply & Trading, which itself is a subsidiary of RWE AG. RWE AG is Europe’s second largest power generation company after EdF, with a share of 7% in the European electricity supply market (see RWE, 2009). Formerly, the Key Account business was part of RWE Energy, which is the Group’s sales and grid company for Continental Europe, offering electricity and electricity-related products, renewable energy certificates, gas, water, and related services. However, this unit will be dissolved in the course of a major reorganization of the RWE Group, which aims at avoiding any form of intermediate holding (see Welt, 2009). As a consequence, RWE Key Account GmbH is now part of the Supply & Trading business unit, which was created in April 2008 as a result of the merger between RWE Trading and RWE Gas Midstream (see figure 2).

Today, RWE Supply & Trading is one of Europe's leading energy trading companies. In 2008, the company traded physical commodities and financial products totaling around 1,200 TWh of power and 124 billion cubic meters (bcm) of gas. Other key areas of business include the trading of coal, oil, CO_2 allowances and biomass. In addition, the company is responsible for the gas procurement activities for customers and power stations, accounting recently for about 40 bcm per year (see RWE, 2009). The company is also active on the worldwide market for liquefied natural gas (LNG), where it cooperates with its US partner Excelerate Energy. Plans include the construction of an import terminal ("GasPort") for LNG on the German part of the North Sea coast, expected to start operation in 2012 (see RWE Supply & Trading, 2009).

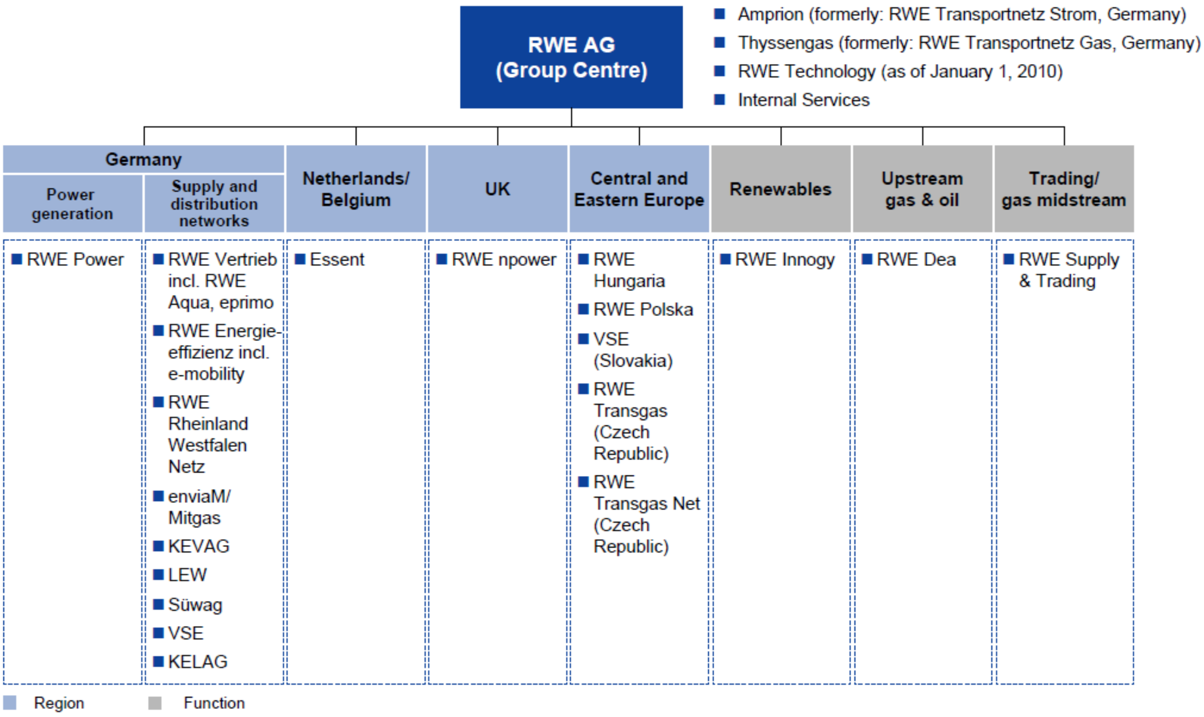
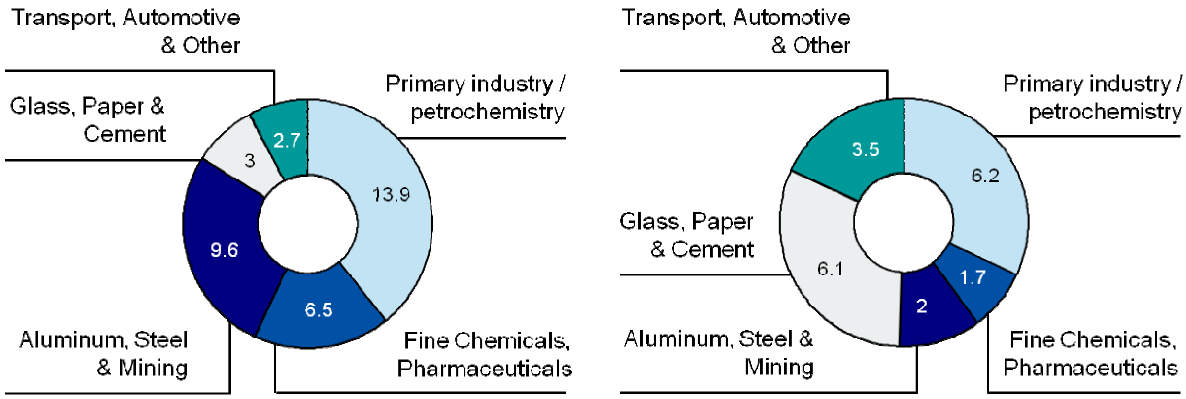


Figure 2: Integration of key account business in the RWE Group

Source: RWE (2009)

In the following, we will define a *key account* as a major customer with an annual electricity demand above 50 GWh or an annual gas demand above 200 GWh. The new structure of the RWE Group will allow the creation of a wider range of products and, consequently, add value to both the utility and its customers. The company is responsible for approximately 400 key accounts from energy-intensive industries, which comprise chemical, metal, paper, glass, cement, transport and automotive production facilities (see figure 3). Annual sales in 2009 amounted to about 27.1 TWh (as compared to 35.7 TWh in 2008) of electricity and 18.7 TWh (as compared to 19.5 TWh in 2008) of gas, corresponding to a combined sales volume of more than €2 billion.



Electricity (in TWh) Gas (in TWh)

Figure 3: Energy sales by industry in 2009

Source: RWE Supply & Trading (2009)

Depending on the company's historical load profile, a major industrial customer has different options to purchase electricity. The risks to be managed usually comprise, besides the security of electricity supply, as major risks aspects such as the commodity price, volume risks, costs due to balancing energy and, in some cases, the exchange rate.

The first of these risks usually is the most important one to the customer. Naturally, every company strives for the lowest costs possible by realizing an optimal market price. Volatile markets and long-term procurement strategies make it difficult to decide whether a current price offered by a utility is competitive in the long run, as distinct forecasts on future market developments are rare.

Second, a customer tries to include as much flexibility as possible in his procurement contracts, based on his needs and historical experiences. Especially during the recent global economic crisis, these volume flexibilities have been an essential part of key account management, as a majority of industrial customers was inflicted by the crisis and, as a consequence, had to lower production. In many cases, this resulted in energy volumes well below those fixed in the contracts.

The risk of balancing energy describes the fact that deviations between the actual need and the forecasted load profile have to be balanced by the transmission system operator (TSO), who charges for this service. Depending on the contract modalities, these costs are either allocated to the customer or to the utility, which in return charges a premium to the customer. Though this risk is more or less a part of the volumetric risks, a distinction is made in the different options for electricity supply.

Finally, every company purchasing electricity throughout Europe has to take the risk of volatile exchange rates into account. Since the introduction of the Euro, this risk has been vastly reduced in more and more EU member states. Nevertheless, companies with production sites in parts of Scandinavia, and more so in parts of Central and Eastern Europe (CEE), still have to manage the risk of rising energy prices due to disadvantageous developments of the exchange rate.

There are different products to satisfy the customers' demands regarding electricity supply and risk management. The most common ones are presented in the following. With regard to the customers' knowledge of energy markets, one can divide the product range into three groups: (i) Customers with full supply contracts; (ii) Customers with a structured purchasing; and (iii) Customers who actively conduct trading activities. By signing a full supply contract, the customer gets an individually tailored contract based on the historical load profile and need for flexibility. As a consequence, the customer usually has a tolerance band, for example, of +/-10% around a load profile forecast which is based on historical data. As long as the real load profile remains within this range, the customer's price refers to the modalities fixed in the contract. When the volume exceeds or falls below the tolerance borders, additional charges – again referring to the modalities in the contract – are imposed. As this part of the contract can obviously result in payments for the customer even if he does not consume electricity, it is referred to as a "take-or-pay" clause.

With regard to the risks discussed above, a full supply contract not only guarantees electricity supply, but by paying a premium the utility takes the risk of balancing energy as well as the volume risk within a certain range. With respect to risk management, a full supply contract induces a massive market price risk, as the price for the whole delivery period is fixed when the contract is signed. Therefore, a company depends strongly on its timing, as the development of market prices is uncertain.

In order to solve the problem of purchasing at one single point in time, structured procurement is offered. In this strategy, the forecasted load profile is structured into standardized products, such as base, peak or off-peak bands. These can then be purchased in multiple tranches mitigating price volatilities due to a cost-average effect, but at the same time also offering the opportunity to profit from low-price periods, thereby reducing the customer's market risk. In return, the customer has to take the volume risk and, as a consequence, the energy balancing risk.

These attributes are usually part of the service of portfolio management. Here, the utility not only sells electricity, but also analyzes the entire customer portfolio, so that, in a next step, an optimal procurement and risk management strategy can be developed. Portfolio management therefore consists of two different components. On the one hand, it involves the pure physical supply and, on the other hand, the financial aspect. In addition, this product covers services such as the management of the customer's balancing group.

The physical component simply describes the process of structuring the electricity portfolio, granting market access and conducting all trading activities which, for example, comprise band contracts, forwards or options. This optimization of the procurement strategy might also include the usage of the customer's generation capacity. To account for the financial risks in the electricity markets, financial products are also part of the portfolio management, in order to realize the pre-defined risk management strategy, such as index-coupled price formulas, or options needed to realize a delta-hedging.[1]

After these initial steps, the focus shifts on price security and the execution of the above-mentioned logistical tasks. Furthermore, a constant risk and position monitoring takes place, as one of the services offered as part of RWE's portfolio management is the access to a web portal called VIEW (Virtual Interactive Energy management Web portal, http://view.rwe.com). Here, the customer can overview the positions and businesses conducted, receive market analyses and use a risk management software to calculate parameters, such as a marked-to-market evaluation of the portfolio, the current Value-at-Risk, or price sensitivities. Overall, the service of portfolio management offers the opportunity to take an active role in today's wholesale markets, without the need for initial investments to build up an appropriate trading infrastructure.

As many customers would like to exploit market opportunities but do not want to be exposed to volume risks, RWE has created a hybrid between full supply and structured procurement, the so-called "Two-Component Full Supply Contract". This model separates the procurement and price fixing of the commodity electricity from the full supply delivery. Therefore, the forecasted annual load profile is structured into base, peak and off-peak products. As these have block shapes, deviations naturally occur and either produce costs, when the consumption is above the purchased profile, or create payments, when the consumption is below it and the TSO compensates for the electricity. These deviations are priced and, together with volume flexibility and a market access fee, included in a premium fixed in the contract. As a consequence, the customer can decide when to purchase which part

[1] Delta-hedging or dynamical hedging describes the process of keeping a portfolio's delta as close as possible to zero. In this context, delta measures the rate of change of an option's value with respect to that of the underlying asset.

of the load profile for the wholesale price, as in portfolio management, but eliminates the volumetric risks by paying a premium to RWE.

3.2 Detailing of customers' requirements

In the course of this case study, regular discussions regarding the additional value a customer hopes to gain from bundling its electricity procurements throughout Europe were performed with two companies, who in the following will be referred to as firm A and firm B. To get at least a broad idea of the business areas of the respective customers, firm A may be described as a multi-national company with a focus on a wide range of consumer goods, and where the partners on the customer side are responsible for the sourcing of electricity in Europe as well as the responsible for the gas and electricity procurement in Germany.

As these job descriptions already indicate, firm A's European energy sourcing is organized in a matrix structure. Beneath the company's head for global sourcing, a European head for sourcing of commodities is installed. On the next organizational level, two employees are responsible for the electricity and gas sourcing, respectively, who monitor and coordinate the local departments. The geographical distribution of electricity needed for 2011 is stylized shown in figure 4. Obviously, while firm A has production sites in CEE countries, its main electricity consumption is in Germany. However, the production network has been expanded into Eastern Europe, with small shares of power consumption in Hungary and the Czech Republic, as well as a larger one in Poland.

During the discussion, firm A's representative explained that the company currently purchases electricity in Germany and the UK via structured products, while in the other countries, full supply contracts are signed. One of the major problems they face when assessing alternatives is the lack of options, especially in the majority of CEE countries, where usually a local market player exists who dominates generation and who has no intention to sell structured products via an electricity exchange.

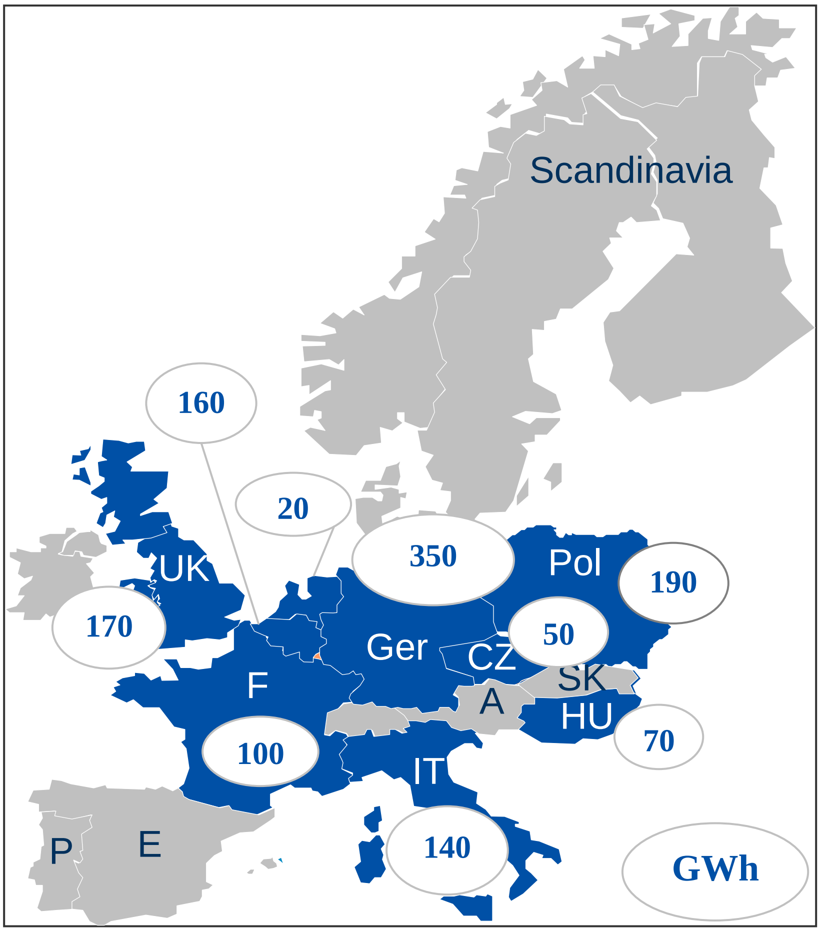


Figure 4: Geographical overview of firm A's electricity requirements for 2011

Source: own illustration, based on RWE customer data (stylized)

Firm B is a family-run business, producing derived timber products. The company already is a customer of RWE in some European countries and has electricity requirements for 2011, as stylized specified in figure 5. Here again, the major part of the electricity needs in Eastern Europe is in Poland. However, electricity consumption of firm B in Hungary, Slovakia and the Czech Republic is more than twice of those of firm A. Based on this background, established customer relations and load profile forecasts, etc., were expected to facilitate the process. However, discussions showed that the responsible persons only had a diffuse idea of what they wanted to achieve. As a consequence, in a first step, we specified the benefits firm A and B hoped to gain from bundling electricity contracts in Europe.

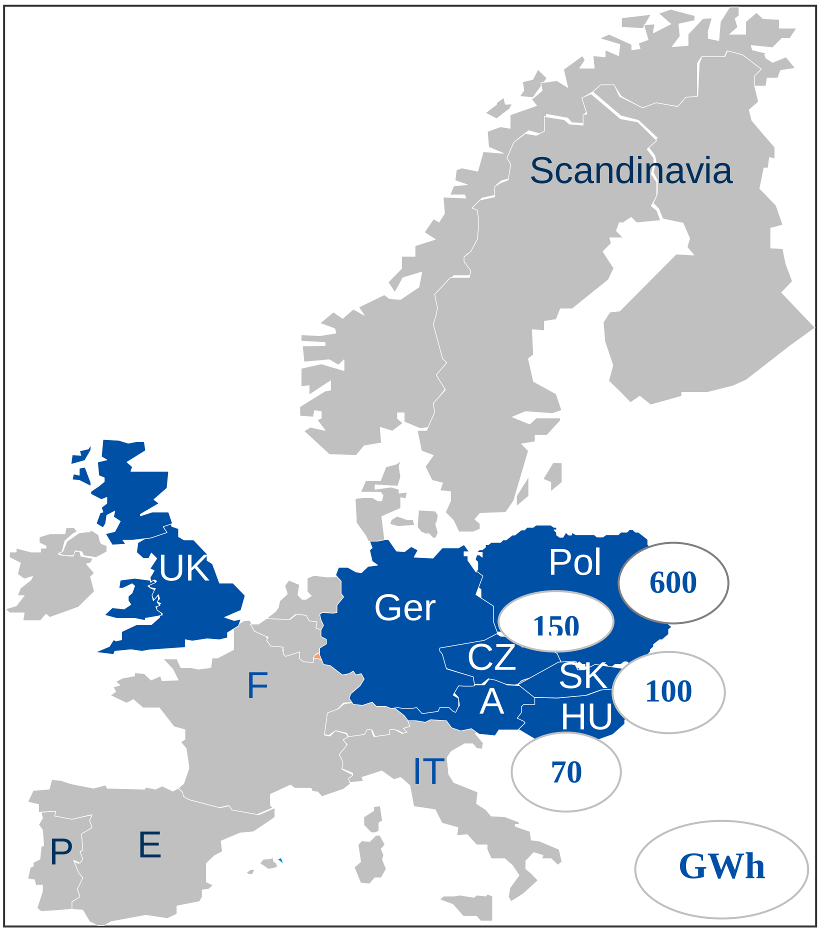


Figure 5: Geographical overview of firm B's electricity requirements for 2010

Source: own illustration, based on RWE customer data (stylized)

In general, the different aspects can be categorized into two groups – benefits regarding a facilitated sourcing process, and such regarding an optimized pan-European risk management. With respect to the sourcing of energy, the customer hopes to realize a more streamlined process. For this purpose, a single point of contact at the counterparty, i.e. the utility, is wanted, as this will result in time- and eventually cost savings. In addition, the time for gathering and distributing information will decrease dramatically on the customer side, which allows a faster and more efficient decision-making. Furthermore, harmonized contracts throughout Europe would facilitate the contract overview, as currently the contract type (structured procurement and full supply contract) as well as the contract duration vary from country to country.

Firm A, in addition, specifically requested the option of a web-based position monitoring to allow easy market surveillance and, consequently, faster reaction to market changes. This service would also add value concerning the customer's risk management, as open positions can be monitored easily and the market prices are more transparent to the staff responsible for the sourcing.

The customer also wishes to widen the product range, especially in CEE countries. As in this region only full supply contracts are currently available, a high time dependence of the market price exists. As described in section 3.1, a separation between wholesale market products and stepwise purchasing could generally solve this problem. However, as many Eastern European power exchanges and forward markets are very illiquid, structured supply is rarely offered at competitive prices. Therefore, the person responsible for power sourcing at firm A had the idea to link electricity prices in the CEE region to those at the EEX, e.g. via a historical average price difference Δ. This would allow the company to purchase electricity in several tranches at the EEX in Leipzig, which the utility in a next step would have to transport to each respective site of company operation throughout CEE. In addition, the customer would not have to bear the exchange rate, as electricity is purchased in Euros instead of e.g. Zloty or Forint. From a customer's point of view, this bundled sourcing at the EEX would also enable typical portfolio effects, as firm A also has smaller electricity consumption volumes in the Netherlands, the Czech Republic and Hungary, whose fluctuations might be compensated by the larger load profiles in Poland and Germany. Furthermore, the customer wants to use the control of one single electricity portfolio to prevent exceeding or under-running the borders of a typical full supply tolerance band. This could be realized via cross-border transfers between the sites in different countries.

Based on the different wishes and expectations, the customers first wanted to focus on the realization of contract bundling in Eastern Europe, as the markets in Central and Western Europe are easier to handle, so that once the major challenges are solved the expansion of the concept westwards in a next step is expected to be comparatively easy.

3.3 Analyses of RWE's presence in CEE

In a first step towards the development of a model for the realization of pan-European electricity procurement, RWE's capabilities in Eastern Europe have to be analyzed. Here, the presence of a regional subsidiary, its product range, as well as the overall market situation is of importance.

Many of the major Western European players in the energy sector, but in particular EdF, E.ON and RWE, used the investment opportunities in the electricity and gas markets of the ex-communist countries for a geographical expansion. Due to a fundamental restructuring of ownership and operations of the former state-owned companies, the Western European utilities were able to enter the new markets and to build up strong positions in some of them (see LaBelle, 2009, for a detailed discussion).

Figure 6 gives an overview of RWE's regional companies in CEE, resulting from the concentrated strategic effort involved in acquiring a large percentage of Eastern European companies. These acquisition and divestiture activities from 1994 to 2007 account for 25% of RWE's overall company activity (see Thomson Reuters, 2007).

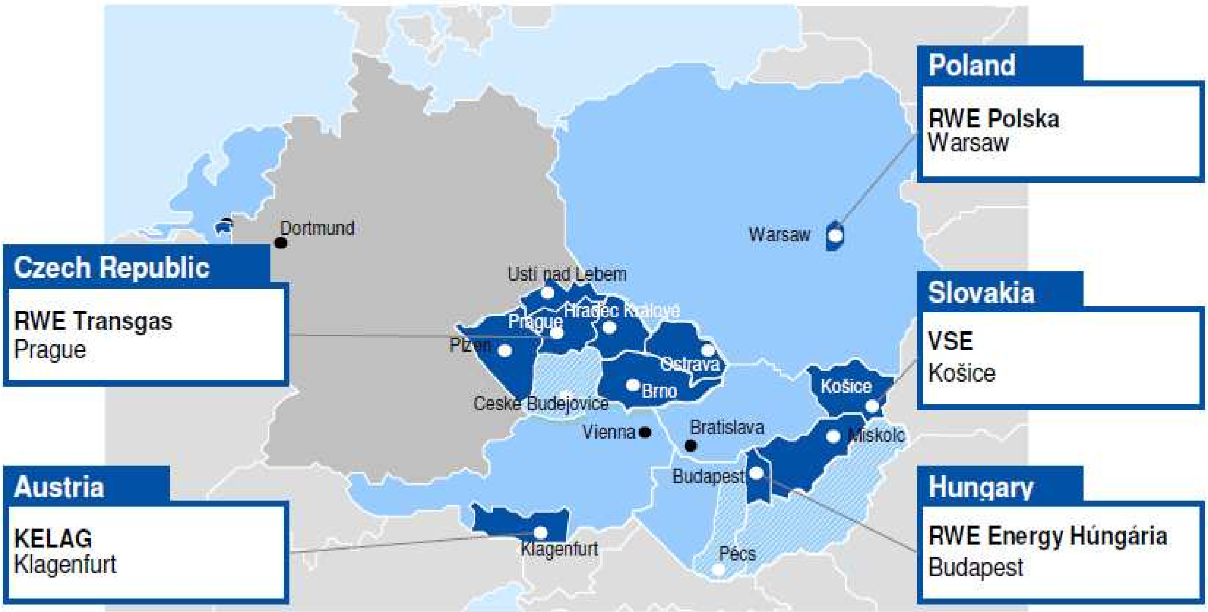


Figure 6: The RWE Group in CEE

Source: own illustration, based on RWE (2009)

As Poland, Hungary and the Czech Republic are of importance to both customers, the focus is geographically restricted to these three countries. The local subsidiary in Poland is called RWE Polska and based in the Warsaw area. Here, it is responsible for the sale of electricity and the Group's development in the Polish market. RWE Polska is one of the two privatized electricity sales companies in Poland. It sells electricity to over 880,000 households and institutional customers, which amounts to a 6% market share in electricity supply in 2008 (see RWE, 2009). Due to already implemented and planned investments, totaling to almost €2.5 billion, RWE is one of the largest foreign investors in Poland. At the moment, the company is planning to build the largest hard coal-fired power generation unit in Poland. It will deliver 800 MW and will employ cutting edge technologies assuring low specific CO_2 emissions. This new unit is supposed to contribute significantly to meeting the growing demand for electricity, which increases at 3-5% per year. The investment is valued at €1.5

billion and will be executed as a joint venture between RWE and Kompania Weglowa, with RWE being the majority stakeholder. Nevertheless, power generation in Poland is strongly dominated by state-owned vertically integrated enterprises like BOT or PKE, who use their customer segments for cross subsidization, resulting in major disadvantages for the other market players not only with respect to prices, but also to customer acquirement outside the own grid area (see CERA, 2008a).

In Poland, the power exchange PolPX was established in 1999 and has been operational since 2000. It is run by Towarowa Gielda Energii (TGE), whose shareholders include seventeen entities, the major one being the State Treasury, who controls more than 22% of the shareholders' equity (see the PolPX website www.polpx.pl for further information). The power exchange's key markets are the spot market for electricity, electricity futures and forward contracts, with physical delivery as well as CO_2 certificate trading, though in 2007 only 2% of the total national electricity consumption was traded at the exchange – whereas 1.6% were traded at the still notoriously illiquid spot market (see CEC, 2009a) – in contrast to more than half of the total volume traded via bilateral contracts (see PWC, 2008).

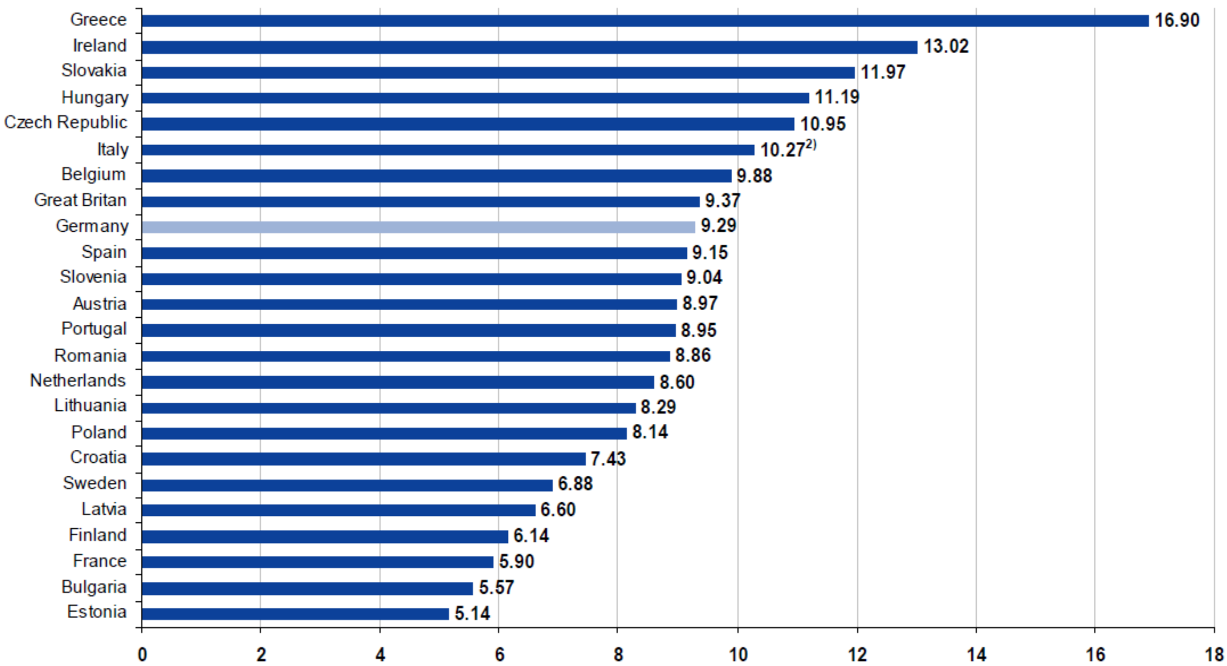


Figure 7: Electricity prices for industrial customers in Europe in €-ct/kWh, 1-6/2008

Source: Eurostat (2009)

Figure 7 depicts the electricity prices for industrial customers in 24 EU countries (EU27 except Malta, Cyprus and Luxembourg) for the first half of 2008. It reveals that the Polish electricity price of 8.14 €-ct/kWh is well below the German one of 9.29 €-ct/kWh. This obviously creates an economic incentive to transfer electricity via cross-border market coupling to Germany. However, polish transfer capacities are characterized by massive congestion, although e.g. capacities amounting to 1200 MW from Poland to Germany and to 1100 MW in the other direction already exist (see PWC, 2008). Referring to Domanico (2007), congestions in cross-border transfer capacity is one of the major risks for the creation of an internal market for electricity, as now in the new market environment investments in power generation compete with those in interconnection infrastructure.

A different situation compared to Poland exists in the fully liberalized Hungarian electricity market. Although with Magyar Villamos Művek (MVM) is again a state-owned company dominating the generation market, RWE subsidiaries (ELMÜ/EMASZ/MASZ) have a share of 15% in the generation market and even 37% in the market for electricity supply, thereby ranking second in the Hungarian market. Electricity sales totaled up to 18.3 TWh, of which 40% went to industrial and corporate customers (see RWE, 2009).

Until now, no energy exchange exists in Hungary. Though the launch of a power exchange was already requested by the TSO Mavir at the National Energy Office in 2008, according to Platts (2009) the first one is only expected to be operational by 2010. Therefore, most electricity is currently still traded via bilateral contracts (see Czech Business Weekly, 04/2008).

From Figure 7 it becomes evident that the Hungarian electricity price for industrial customers (11.19 €-ct/kWh) belongs to the most expensive ones in the European Union. As a consequence, companies with generation capacity in neighboring countries are interested in selling their electricity in Hungary, as this will generate profits even after the payment of congestion rents (settled via bilateral auctions) for cross-border transfer. These net transfer capacities are again vastly underdeveloped; for example, only 100 MW from Hungary to Austria, and 500 MW in the opposite direction exist.

In the Czech market, RWE's activities are controlled by RWE Transgas, whose main business is natural gas import and trade. In the gas market, this subsidiary has a market share of roughly 70% (see RWE, 2009). The major competitors in the electricity sector however, are the three vertically integrated companies CEZ, E.ON and PRE, who currently dominate the Czech market as they represent a share of almost 80% in the market for electricity supply (see CERA, 2008a). This setup is bound to continue, as the dominant position of incumbent CEZ as national champion is favored by the government. In order to prevent strategic pricing by CEZ, the local regulatory authorities have recently put a new antitrust regulation in place. As a consequence, companies entered the market procuring their electricity mainly through a partnership with CEZ. In order to have access to electricity, and to use its strong position in the gas market for the cross-selling of electricity, RWE Transgas has to purchase the commodity from a competitor, transport the electricity from Germany or another neighboring country to the Czech Republic, or buy it at a local energy exchange.

In the Czech Republic, two power exchanges exist. The older one, called Operátor trhu s elektřinou (OTE), was founded in 2001 by the Czech state, which is still the company's sole shareholder. Since 2002, the OTE has played an important role in the Czech electricity market, especially in the clearance and financial settlement of imbalances. At the same time, OTE acts as organizer of the short-term electricity market, as well as of the balancing market with reserve energy. In addition, the government-owned company monitors emissions trading by running and administering a registry for the trading of GHG emission allowances (see OTE annual report, 2008).

In 2007, a new business platform for trading with electricity in the Czech Republic and Slovakia was established, called Power Exchange Central Europe (PXE), based in Prague. The Prague stock exchange is the prime mover behind the PXE. At this exchange, future contracts on base and peak load in monthly, quarterly and annual increments are offered. The places of delivery are the electricity transmission grids of the Czech Republic, Slovakia and Hungary (see www.pxe.cz for further information). No spot market is planned yet, although the PXE wants to develop the country's existing illiquid spot market which is run and operated by OTE, and where in 2006 only 4.3% of the country's electricity consumption was traded (see PWC, 2008).

As mentioned above, CEZ is the dominant player in the Czech electricity market. Therefore, it is also the main market maker at the OTE. As the price level compared to Poland, Germany and Austria is high (see Figure 6), electricity transmission into the Czech market is of interest. However, cross-border transfer is again hindered by congestion, even though net transfer capacities to the Czech Republic from Germany (700 MW), Poland (1660 MW) and Austria (600 MW) exist (see PWC, 2008). Extensions of cross-border capacities could increase the competitive pressure. Nevertheless, significant changes in that area are unlikely to take place in the short to medium-term.

3.4 Model development for pan-European bundling of electricity contracts

With respect to the customers' demands concerning the attributes of a European bundling of electricity contracts, described in section 3.2, we will focus on the realization of the following aspects. The aim is the creation of a central management for Poland, Hungary and the Czech Republic, with a structured procurement process via a single point of contact. In all countries, regional specifications shall be reduced to a minimum in order to assure harmonized contracts.

As explained in section 3.1, the customer usually has to take the volume risk in this set-up. As the costs for balancing energy in CEE countries, charged by the respective TSO, are somewhat intransparent, and the power exchanges at which the short-term need for electricity could be satisfied can be highly illiquid, this risk position might result in high costs. Compared to the currently dominating full supply contract, it would also pose a dramatic disadvantage in the market. Therefore, we identify the introduction of Germany's 'Two-Component Full Supply Contract' as the most promising approach. This option, on the one hand, allows the customer to purchase electricity gradually while, on the other hand, he will not be exposed to the volume risk, i.e. specifically uncertain and high costs due to the need for balancing energy.

For the design and launch of such a product, three direct approaches are identified in cooperation with the product management. First, the respective regional company is capable to offer structured procurement via its current generation portfolio. Second, the subsidiary organizes a structured procurement via the local energy exchange. Third, RWE transfers electricity from Germany via cross-border interconnectors into the respective countries, where the regional company organizes the supply into each TSO area, as well as the balancing energy. Discussions with the responsible parties, i.e. especially the local key account management and the traders of RWE, revealed that all three approaches are impractical. In some countries, as e.g. the Czech Republic, the generation as well as the customer portfolio is too small to assure profitable customer supply with structured products at competitive pricing, due to a lack of positive effects on the subsidiaries' electricity portfolios. As described in the previous chapter, not all countries have working power exchanges in place yet that are, in addition, liquid enough to allow for structured sourcing well in advance. Therefore, pure supply via trading is hardly possible. Even the third approach, which consists of cross-border transfers, does not allow for competitive pricing, as constant supply has to be assured. In case of congestion or technical maintenance, it would not be possible to transfer enough electricity from the German grid into the respective market. As pointed out in the country analysis, congestion is a constant problem in CEE. Therefore, a trader offering this service has to include a significant premium in order to manage the risks occurring from a lack of electricity, which would be settled either via balancing energy or, if it exists, the local spot market.

The only competitive way of supplying electricity in CEE's markets, available in each country, is the full supply. As this is the contract type currently employed by customers anyway, a contract bundling would neither add value nor meet the demand. Therefore, another approach has to be developed. As mentioned above, the uncoupling of energy supply and price fixing is a central aspect of modern risk management. As a consequence, we will adapt such a concept in order to transform a local full supply contract via financial operations into a transparent structured procurement.

In order to assure the physical supply of the customers' production sites, a full supply contract with a local utility is vital. As in such a contract the price is fixed at the moment of signing the contract, a financial transaction as well as a market place will have to be identified, at which a wide range of products with high liquidity are traded. The latter is needed to avoid large bid-offer spreads causing high and unpredictable transaction costs. In the following, a proper market place is identified. Then, we develop a concept employing financial transactions.

If a structured procurement for Eastern Europe via financial transactions at one central market place is to be realized, its power exchange has to satisfy several prerequisites. First of all, it has to offer a wide range of products, so that enough options exist for a model creation. Second, these products have to be liquid enough. As described in the previous section, the energy exchanges in CEE countries satisfy neither the first nor the second requirement, as they are not developed enough, or do not even exist yet (see Hungary). Therefore, another exchange has to be identified. The focus will obviously shift westward, as especially the French and German power exchanges meet the prerequisites. In order to trade products in a country which is not part of the geographical set-up, prices at its power exchange have to correlate as strongly as possible with those in the respective markets in CEE. Table 1 reports on the correlations between the spot prices at several European power exchanges, namely the Dutch APXNL, the Belgian BELPEX, the German EEX, the Austrian EXAA, the Scandinavian Nord Pool (NP), the Czech OTE, the Polish PolPX and the French Powernext (PN), calculated from the exchanges' data for spot market prices from 2007 to 2008.

Obviously, the spot market prices at the Polish PolPX and the Czech OTE correlate very well with the one at the Austrian EXAA and the German EEX, as the correlation is 0.75, respectively 0.68, for the PolPX, and 0.96, respectively 0.90, for the OTE, a finding, which is also valid for the PXE. Discussions with experienced traders of RWE for trading activities in Central and Eastern Europe revealed a comparable price development for the Hungarian market. As the German EEX is much more liquid than the Austrian EXAA, it is chosen as the basis for financial transactions.

Table 1: Market correlations of the day-ahead electricity spot prices (base) 2007

	APXNL	BELPEX	EEX	EXAA	NP	OTE	PolPX	PN
APXNL[a]	1,00							
BELPEX[b]	0,90	1,00						
EEX[c]	0,75	0,74	1,00					
EXAA[d]	0,77	0,77	0,90	1,00				
NP[e]	0,59	0,62	0,69	0,75	1,00			
OTE[f]	0,77	0,78	0,90	0,96	0,70	1,00		
PolPX[g]	0,61	0,61	0,68	0,75	0,72	0,73	1,00	
PN[h]	0,72	0,90	0,79	0,85	0,72	0,85	0,66	1,00

Notes: [a] www.apxendex.com, [b] www.belpex.be, [c] www.eex.de, [d] www.exaa.at, [e] www.nordpool.com, [f] www.ote.cz, [g] www.polpx.pl, [h] www.powernext.fr.

Source: own illustration, based on data of the respective power exchanges

After having identified a suitable power exchange, proper transactions have to be created next in order to transform a full supply into a structured procurement. As the full supply contract is the necessary basis for physical supply in the respective countries, the structured procurement via trading is obviously only of a financial nature, as it only models the properties of a structured procurement.

In a first step, the price fixed in the full supply contract has to be unlocked and exposed to the market development. This can be done easily by short-selling of an electricity volume. In finance, short-selling is the practice of selling assets, usually securities that have been purchased from a third party, with the intention of buying identical assets back at a later date to satisfy the third party. The short seller hopes to profit from a decline in the value of the assets between the sale and the repurchase, as he possibly pays less to buy the assets than he received when selling them. Conversely, the short seller will make a loss if the price of the assets rises. In the current case, the lender is simply the market and the traded good obviously neither securities nor shares, but electricity, i.e. a physical commodity.

Based on this concept the customer can trade at the EEX in Euros, thus avoiding any exposure to exchange rate risks. Therefore, he has to sell a specific volume short at the EEX, while at the same time he signs a full-supply contract. The volume, which is sold at the EEX, has to be equivalent to the minimum volume fixed in the contract. This is necessary, since such a hedging transaction is only possible with equivalent volumes. As the only fixed volume is the min-take volume in the respective countries, it defines the reference value. Now the customer has an open position at the market and depends on the price development. As mentioned before, he has to buy the short-sold volume back, before real physical supply takes place. Due to risk management principles, he will repurchase the electricity in several tranches, so that his position is flat at the moment of delivery. This combination of short-selling and repurchasing naturally results in a certain difference when all positions are cleared, as the price obtained by selling is obviously not the same as the average costs of buying electricity back. This difference does not necessarily have to be positive and, as a consequence, subsidize the fixed price in CEE, but can also result in additional costs. However, comparing the process to the one of a structured procurement, one can easily identify the similarities and conclude that the approach described allows for the creation of a financial structured procurement and therefore the realization of one Central European-wide risk management strategy. In contrast, obviously no physical portfolio effects are enabled.

To illustrate the process based on this idea, we provide an example for firm A's electricity needs in Poland. The overall concept is shown in figure 8 from the customer's point of view. It is obvious that a separation of physical supply (on the right-hand side) and price fixation (on the left-hand side) takes place. At a specific moment in time t_0, the customer signs a contract with, say, RWE Polska and thereby purchases a full supply contract for a price of P_0(POL).

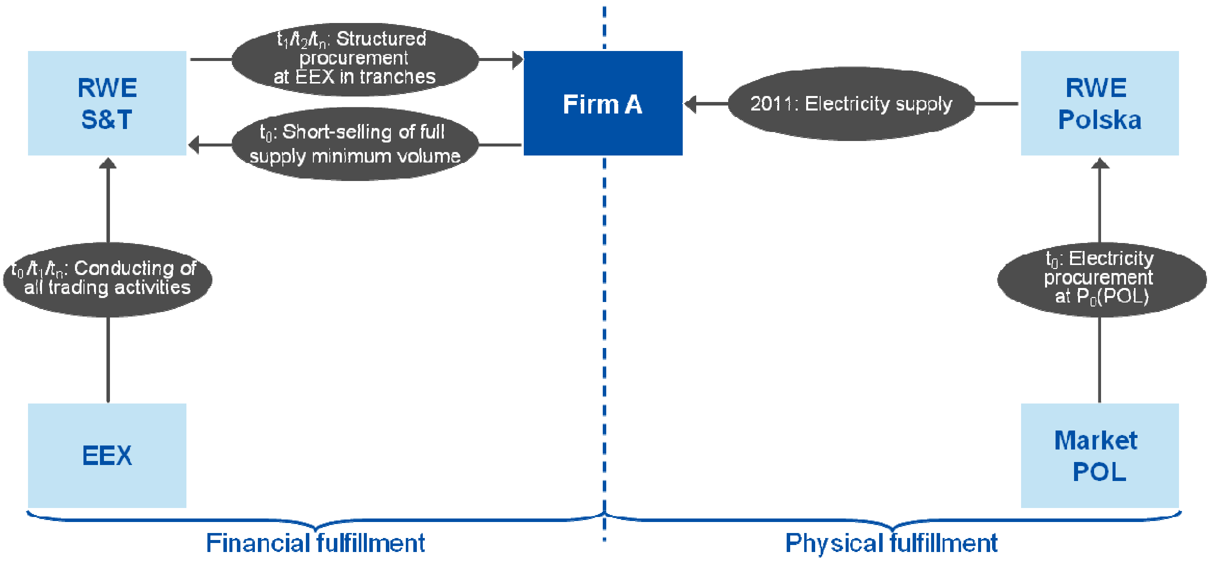


Figure 8: Process scheme from customer A's point of view

Source: own illustration

At the same time, the customer short-sells some of the electricity volume fixed in the contract at the EEX at P_0(EEX). As the prices at EEX and PolPX are well correlated and consequently also have a similar price development, the customer has transferred his physical position in Poland to a financial one in Germany. In order to guarantee a pure financial transaction, no open position must exist at the moment of real physical delivery. Therefore, the customer has to buy back his short-sold volume. To simulate a structured procurement, he gradually purchases the electricity needed in tranches. As he pays different prices P_{t1}(EEX), P_{t2}(EEX) etc. each time, an average price $P_Ø$(EEX) is realized resulting in a Δ (= $P_Ø$(EEX) – P_0(EEX)). If this Δ is negative it will subsidize the local price and reduce it to P_0(POL)–Δ. In return, if it is positive, this difference will increase the local price. However, even if the latter happens, it will more or less result in the same higher price a customer would have to pay if sourcing his electricity demand via a structured procurement in the first place. Naturally, this price is only valid for the minimum volume which was traded, while for the rest of it the price remains at P_0(POL) (figure 9). In the left plot of figure 9, the current situation is shown. As is typical for a full supply contract, the customer has a historical load profile on the basis of which a forecast (middle line) is made. Around this forecast, the customer has a tolerance band (dashed lines) in which his price is constant P_0(POL). Now this volume is split. The min-take volume (see upper figure on the right-hand side of figure 9) is traded at the EEX, thereby resulting in a price P_1=P_0(POL) –Δ, while the price for the rest of the volume remains at P_2=P_0(POL).

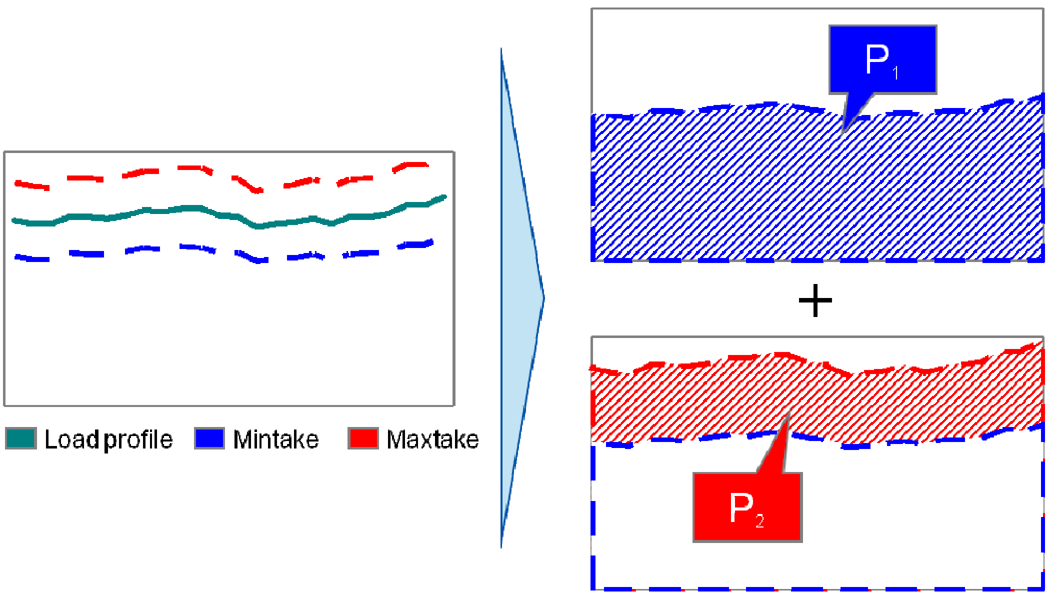


Figure 9: Comparison of price models

Source: own illustration

In summary, the presented concept consists of two components: On the one hand, it comprises a local full supply contract and, on the other hand, a trading contract, allowing for the short-selling and repurchasing procedure.

4 Conclusions

In this paper, we have developed a concept for the pan-European bundling of electricity contracts and the realization of one central company's risk management strategy throughout Europe. To this end, in a first step, we assessed the liberalization process of energy markets in the European Union and discussed the 3rd legislative energy package. In this context, changes in market opening, third-party access and the operation of the transmission system are of particular interest, due to their importance for the liberalization process.

As a next step, we analyzed the resulting consequences for a company's risk management with a special focus on utility companies, revealing particular exposure to price, volume and counterparty risk. Finally, we analyzed the risk management activities for companies at RWE Supply & Trading. As risk management is also a central aspect of a company's sourcing strategy, discussions with customers revealed the need for a central sourcing via structured products and the realization of a central risk management strategy throughout Europe.

Both of these needs are currently difficult to satisfy, especially as they are focused on three CEE electricity markets: Poland, Hungary and the Czech Republic. In the analysis, we focused on the competition in supply and generation, the maturity of power exchanges and the current cross-border capacities, as well as RWE's presence in the respective countries. The analysis revealed that, due to the lack of market maturity, no structured procurement is possible in any of the countries mentioned. Therefore, the need for a new product arises. A concept was therefore developed, separating physical delivery from financial transaction by a combination of local full supply contracts with short-selling or repurchasing, respectively, of electricity volumes at the German EEX power exchange.

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