Accounting and Performance Issues in Swiss Electricity Trading

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Abstract:
In this paper, we assess the revenue potential of asset-backed trading in the Swiss utility sector. We demonstrate the need for greater transparency regarding hedging transactions, asset-backed trading and proprietary trading. We show that the performance risk of prop trading might overlap with the hedging or revenue potential of asset-backed trading. Our findings emphasize that a differentiated performance and risk assessment disclosure in the notes, in particular with regard to risk of speculative transactions, must be part of good corporate governance.
1. Introduction and Motivation

The necessity of *prop trading* as a core component of the Swiss electricity companies’ business model is politically controversial. At the same time, it is clear that trading electricity represents a contribution to value because it enables the flexible management of power plant capacities. In addition, the trading volume increases market liquidity and thus the efficiency of the electricity markets, which is generally a prerequisite for functioning markets and must therefore be viewed positively.

However, increased transaction volumes and trading pose new challenges for the reporting systems of electricity companies, especially with regard to performance and risk reporting of the individual company activities in electricity trading. The ability to make and carry out decisions, in particular the supervisory bodies of the power companies, must be guaranteed. It presupposes reliable information for the Board of Directors and the Executive Board on the performance and risks of the electricity trading transactions. These transactions must be differentiated from other transactions involving the production, procurement and sale of electricity.

This paper emphasizes the importance of a clear differentiation and traceability of commercial transactions. It calculates the potential contribution of the individual activities in electricity trading. It demonstrates the necessity of a strict partition of *marketing, hedging activities, asset-backed trading* and *prop trading* for electricity companies in internal and external reporting.

We are following up on previous work [11,12] in which we previously critically examined the published annual results (2015‐2018) for energy trading by the leading Swiss electricity producers. In [12] we based our analysis on the fact that energy trading includes *asset-backed trading* and *proprietary trading* (*prop trading*). This simple cumulative effect, applied to the EBIT for *energy trading* reported in the respective segment reports, is calculated as an imputed loss of CHF -264 million for *Axpo* in *prop trading* and CHF -85.5 million for *Alpiq* in 2015‐2018 [11]. Expressed as the contribution of *prop trading* to the return on equity, this corresponds to an average of -5.30% for *Axpo* and -2.24% for *Alpiq* over the period 2015-2018.

In contrast to *Alpiq* and *Axpo*, *BKW*’s financial reports for the 2015-2018 financial years [5] do not include an "energy trading" segment, the profit from *prop trading* is reported separately as part of the overall *Energy* business unit. For *BKW*, we have therefore estimated the result from "energy trading" from the sum of the imputed revenue potential of the power plant portfolio as part of *asset-backed trading* and the profit from *prop trading* published by *BKW*.

The above conclusions are based - under the defined model assumptions in [9,10] - on our estimates of revenue potential within *asset-backed trading*. The calculated revenue potential does not include the intrinsic value of the annual power plant production. The intrinsic value of the annual power plant production (or in short: a power plant) is the contribution to earnings made by annual production.

In practice, however, there are also earnings contributions from hedging transactions that are not accounted for as *hedges* or where the *hedging contract* is terminated before the hedged
transaction is settled in the year under review (de facto the accounting option under IFRS or accounting mismatch in the case of risk management). As a result, the annual result in energy trading is defined as the sum of the results from asset-backed trading, prop trading and hedging transactions for which hedge accounting is not applied.

We define prop trading as speculative trading without reference to the use of certain resources (e.g. power plant, transmission capacities, storage). We do not regard hedging strategies, their impact on earnings or production, procurement and distribution for delivery purposes as part of prop trading. Prop trading requires the use of risk limits in order to control loss risks. Compliance with the risk limits must be monitored by the management. In addition to the earnings contributions derived from prop trading, in [10] we also show estimates for the risk exposure in energy trading, which we use to derive a risk-adjusted performance in prop trading on the basis of the information available from the financial and annual reports.

In this paper, we want to explicitly include the intrinsic value of power plants and the success of hedging strategies in our analysis. We calculate the intrinsic value for the power plants as the revenue from electricity production in relation to a reporting period on the basis of the Swissix day-ahead auction price for the Swiss market area less EBIT-relevant production costs, for which we take the [2e] published by the SFOE as basis. The EBIT-relevant production costs correspond to production costs, depreciation and taxes, excluding capital costs, imputed profits and taxes. For the hedging strategies we select a benchmark that results from a rolling hedge with futures over 3 years, applied to the Axpo balance sheet of (September 30), Alpiq and BKW (31 December). We calculate imputed revenues from asset-backed trading on the basis of [9,10,11] from the marketing of flexible capacities in the spot market or in the market for system services (SDL) and from the monetization of volatility in the futures markets.

In our communication with various market players (representatives of electricity suppliers, auditing companies, regulators and supervisors), our assumptions were critically questioned. In particular, the imputed revenue potential in asset-backed trading shown in [11] is rated by electricity traders as "clearly too high", and it is also emphasized that prop trading can indeed generate profits. We are aware that model assumptions simplify reality ([10]). In the course of this simplification and possibly incomplete information in the financial reports of the leading Swiss energy companies, the results may become vague, which may call into question the significance and conclusions in [10,11]. In this article we show the robustness of our findings.

The purpose of this paper is to document our understanding of the opportunities and risks in electricity trading as well as the necessary transparency on the basis of our model structures and the associated assumptions. We demonstrate the necessity of making a clearer distinction between asset-backed trading and prop trading in internal and external reporting, avoiding confusion with hedging strategies and creating appropriate incentive structures. The goal is to improve the ability of electricity companies to act and make decisions within the framework of corporate governance. The transparency and assessment of the performance and risk of different trading and hedging transactions must be guaranteed, if only to avoid being accused of cross-subsidization and unsupervised risk acceptance as a result of intransparent reporting. As a consequence, performance measurements must be differentiated and success in asset-backed trading and hedging transactions must be reported separately from success in prop trading. This must be combined with auditable documentation for risk controlling, management, the Board of Directors and, last but not least, for external auditors.
Arguments and insights from our discussions with market players shape the structure and content of this paper, which we also see as a strategic paper for the Swiss electricity industry: In Section 2, we describe the added value in electricity trading created by the liberalization of the electricity market. We raise awareness of the fact that in asset-backed trading not all trading transactions involve physical delivery and yet generate added value. We also differentiate the intrinsic value of a power plant as a periodic contribution to earnings from the fair value of a variable capacity. Section 3 discusses the degrees of freedom of electricity traders, which subsequently demand a differentiation between asset-backed trading and prop trading. The way in which these degrees of freedom are implemented by electricity traders provides information about their performance and competencies. In Section 4, we review our approach and the model assumptions made for determining the imputed revenue potential from power plant management, hedging and asset-backed trading and highlight their sensitivities. In Section 5, we apply our approach to the 2009 financial year, which represents the first financial year in the partially liberalized Swiss electricity market. Finally, we summarize our findings in Section 6.

2. The Added Value of Electricity Trading Due to Liberalization

With the liberalization of the electricity market, exchanges and trading platforms were launched to support short and long-term electricity trading. The spot markets serve to optimize flexible storage capacities in the short-term and the futures markets to hedge electricity production over the long-term. Both markets are also used for speculative trading transactions.

We refer to [20] according to which Switzerland is singled out as the electricity hub of cross-border electricity trading with its great opportunities for commercializing Swiss power plants. Of Switzerland’s neighbors Italy probably plays the most important role. Even if the price spreads between Switzerland and Italy have narrowed, the significance of Italy for Switzerland as an electricity hub - with reference to [21] - has not changed significantly to date.

In [11], we used a simple example to show how volatility can be monetized using replication strategies and how asset-backed trading can be distinguished from prop trading. We now focus on asset-backed trading and start with a regulated framework. We take the structures in this simple example to explain that the potential revenue of (flexible) storage power plants is made up of an intrinsic value and a premium for flexibility. In this context, we will also differentiate the term power plant optimization from asset-backed trading because it is useful for decision making in terms of risk monitoring and performance measurement of energy trading.

Before the liberalization of the electricity market, i.e. under regulated framework conditions, electricity prices were deterministic, base load and peak load defined the different price levels, so that fixed revenue potentials existed without a flexibility premium. The power plant optimization refers to the determination of the timetable of different types of power plants with which the highest overall revenues are achieved, taking into account the technical restrictions on operation. The optimal timetable also defines the physical delivery. The revenues generated with the physical delivery minus the power plant-dependent EBIT-relevant production costs define the intrinsic value of a power plant. In particular, it should be emphasized that it does
not generate revenues in those hours in which the power plant does not produce. Thus, under regulated conditions, the **intrinsic value** may be used as an estimate for EBIT.

**With the liberalization of the electricity market** and the corresponding introduction of spot markets, it became possible to trade the price of an electricity delivery on an hourly basis, with the trading period extending until shortly before the start of delivery. This allows for the possibility of repurchasing a delivery promised at the beginning of the trading period - and thus a promised use of the power plant - at a later point in time, but before the start of delivery. An electricity trader will make use of this option when the price for this electricity supply has fallen. This possibility would not have existed under regulated conditions or under deterministic prices. With liberalization, additional revenues can be generated on the spot market and in cross-border electricity trading without physically supplying electricity. We recognize this type of revenue as **added value** that is generated in addition to the **intrinsic value** of the power plants. This **added value**, which we attribute to **asset-backed trading**, has emerged with liberalization and significantly increases the value of the power plants. At the same time, the power plants provide the risk capital in physical form. As long as the price does not fall below the **trigger price** (marginal price) above which the trader has committed to a physical delivery, the electricity can be called upon with a positive contribution to earnings.

*Additional revenues* (I) that are generated without physical delivery can be distinguished from those *additional revenues* (II) that form the basis of a physical delivery and thus of a power plant operation. Both *revenue types* represent trading successes which we attribute to **asset-backed trading** because in both cases the trading position in the spot market is opened at the time and at the current price level and power plant capacities are thus planned for the supply of electricity. In the current annual and financial reports of the Swiss electricity producers, the term "**power plant optimization**" stands for *optimized schedules* and is associated with a physical delivery of electricity from a power plant whose success is made up of the **intrinsic value** and the **additional revenue II**.

The number of trading transactions closed without physical delivery can be estimated using methods of *option price theory* [17]: if the trigger price for a flexible power plant capacity (turbine) and the forecasted hourly spot price coincide, then with a spot price volatility of 150% the proportion of **asset-backed trading** transactions that result in physical delivery is 23%. This means that 77% of **asset-backed trading** transactions do not result in physical delivery. Conceptually, this can be explained by the strong asymmetry in the form of a right skewness of the hourly spot price distributions, which can be empirically proven [26]. With increasing volatility and trigger prices (for turbines), this proportion increases to about 90% in favor of **asset-backed trading** transactions without physical delivery. At 77%, the MWh is traded on average 4.35 times until it leads to a physical delivery via turbine use. At 90% (due to higher volatility or a higher trigger price), this MWh is traded 10 times on average. These shares also have a high practical relevance: If it can be anticipated that no physical delivery will be triggered in at least 77% of the cases, then only 23% of the available storage energy is needed to generate the **added value or flexibility premium** of a flexible turbine.

For pumping capacities, contrary statements can be made: without a further detailed analysis of the argument, the pumping energy is traded within a corresponding range of 1.11 to 1.30 times, until it is physically withdrawn by means of a pump.
If a resource (e.g. power plant, storage facility, transmission capacity) is planned or a delivery obligation to the end customer is met when a trading position is opened, we assign this position to asset-backed trading. At the same time, we want to define the difference to prop trading (proprietary trading): a trading position for which no asset is planned when it is opened or which serves to cover a delivery obligation requires a settlement (whether via the stock exchange or via OTC) at the latest when it expires, subject to compliance with specified maximum loss limits. It is also assumed that the corresponding volumes within which production or delivery obligations can be guaranteed are not exceeded. In this sense, trading transactions in which volume limits are exceeded or in which bandwidths for hedging strategies are deviated from are considered speculative trading and thus prop trading.

In regulated environments, there were services to ensure grid stability. These were reimbursed quasi as reserves of suitable power plant capacities. With the start of partial liberalization in 2009 and the creation of the transmission grid operator Swissgrid, a new market for system services (SDL) was also created in Switzerland. The various products for SDL were allocated by auction. Once they have been allocated, the corresponding power plant capacities are no longer available to the electricity trader for trading during the corresponding periods: the power plant capacities may be accessed by Swissgrid due to unforeseeable disruptions in the grid and must therefore be ready for use at any time. The offer prices for SDL products are based on the opportunity costs in the spot market and on the product-specific obligations regarding the mode of operation of the power plants. The auction prices of the SDL products must be reduced by the market value of the promised and ordered electricity supplies in order to delimit and quantify the added value of the SDL products compared to the intrinsic value as a periodic contribution to earnings of the power plants. In this way, we define the added value of an SDL as the amount that is generated in excess of the intrinsic value.

It is in the very nature of spot trading and the obligation to make the auctioned power plant capacities available at short notice that flexible power plants in particular generate this added value (quasi a flexibility premium). These are storage power plants and pumped storage power plants with their annual and weekly storage facilities as well as high-pressure run-of-river power plants with their daily storage facilities. The trading of flexible power plant capacities on the spot market is closest to SDL’s tertiary control power product in terms of maturities until the start of delivery.

Last but not least, it should be noted that liberalization has not only created added value (flexibility premium) relative to intrinsic value, but also greater competition, which has resulted in a collapse in prices with a sharp surge in turnover in energy trading. SDL products have also experienced increased competition, as the minimum performance requirement for qualifying for participation in an auction has been substantially lowered. This means that large-scale consumers and new battery technologies are also suitable in providing system services.

We recognize that the opportunities for electricity traders to generate added value are growing. It is no longer necessary for electricity traders to rely on storage power and pumped storage power. The best offer wins. As a result, storage power and pumped storage power are becoming more and more available for trading in Switzerland and across borders to neighboring countries. If trading units have adjusted or even actively contributed to the expansion of the SDL offer, these market players will have little interest in changing the SDL products in the direction that increases the competitiveness of storage and pumped storage
for the market of system services. This is yet another indication of the fierce competition between the three largest Swiss electricity producers. Finally, it should be noted that market players do not see the increase in volatility in market prices as being responsible for the massively higher trading volumes, but rather the drop in electricity prices.

3. Degrees of Freedom in Energy Trading

The intrinsic value of a power plant or a supply contract represents a potential minimum result to be realized within the framework of power plant optimization. Swiss energy suppliers are faced with the challenge of making the best possible use of opportunities within Switzerland and in cross-border trading in order to generate added value above and beyond its intrinsic value. Power plant portfolios (including virtual power plants in the form of specially designed contracts) as well as trading and sales portfolios must be managed in compliance with minimum requirements for risk management and risk controlling. Risk Controlling is responsible for independent reporting on changes in the value of trading positions, their market, credit and volume risks and for compliance with risk limits. The EBIT targets and risk limits allocated by the Board of Management, broken down by power plant, trading and sales portfolios, define the degrees of freedom in energy trading.

Under asset-backed trading, hydropower plants in particular are pooled in order to take local weather influences into account. The trigger prices for the use of power plants depend on the local feed including precipitation and storage levels. These trigger prices change hourly and thus also the order of the power plant centers with regard to price levels. Even if the amount of precipitation is well forecast, there may be considerable shifts in the timing. It would be inefficient to allocate power plants with a higher trigger price before those with a lower trigger price for SDL or spot trading. The power plant with the lowest trigger price provides the greatest added value, even if the current market price of the physical delivery is the same for all capacities. Asset-backed trading thus contributes significantly to an economically efficient electricity supply, which must be guaranteed as part of the revision of the StromVG (SFOE 2018 [2g]).

Power plant production can be hedged on a value basis by means of futures or forward contracts. Changes in the value of hedging instruments are not included in the annual result until the hedged transaction has been settled. As long as this is the case, changes in the value of the hedging transactions are also reported as energy derivatives and, depending on their nature, reported as assets or liabilities. In order to keep the changes in value of the energy derivatives used for hedging outside profit or loss, the changes in value are booked directly to equity without making the "detour" via the income statement. The effect on income of the hedging transaction is thus postponed until the hedged transaction has been settled. This corresponds to the principles of hedge accounting in accordance with IFRS with the goal of determining income on an accrual basis. Otherwise the hedging transactions would affect the result for the period prematurely.

Companies must identify the hedging relationship as such and document the effectiveness of their hedging to claim hedge accounting. The IFRS requirements for hedge relationships are relatively strict and not every hedge qualifies for hedge accounting. In particular, the hedging of open portfolios or the hedging of transactions by a series of instruments with different
maturities often leads in practice to hedges not being recognized and reported as such due to the complexity and ongoing documentation requirements of such transactions. This would result in an accounting mismatch.

If, however, a hedge relationship is reported as such in the balance sheet, the IFRS accounting consistency requirements stipulate that hedge accounting should not be applied arbitrarily or should not be withdrawn for accounting purposes, e.g. in order to report earlier successes of hedging instruments.

Nevertheless, the application of hedge accounting is a de facto option. The hedge relationship must be rigorously documented by the company, which can in principle take place after the balance sheet date, but at the latest before the annual financial statements have been audited.

It is also possible to change the accounting treatment of hedging instruments that is recognized without effect on profit or loss as a result of actions taken by the company, for example, if the hedging instruments are settled before the underlying transaction is settled. The change in the value of the hedging instrument, held until then with no effect on profit or loss, is thus effective and can be reported as a trading profit in the annual results.

It is therefore at the discretion of management to determine the ranges and rules within which a hedging strategy is to be implemented and which shares may be included in advance as trading income in current financial years. We regard discontinued hedging activities as speculative positions, the success of which should be included in prop trading.

Within electricity trading, we have also shown that a large proportion of trading transactions attributable to asset-backed trading generate additional revenue without triggering physical delivery. If these transactions are allocated to prop trading, this can lead to an overriding of the allocated EBIT targets and risk limits as well as to distortions in the risk capital used and the performance measurement in favor of the trader. Equally important is the integration of volume risks in asset-backed trading: if the traded volumes of the individual trading transactions deviate from the realistic production volumes, in asset-backed trading de facto speculative trading transactions are pursued because the difference between trading and production volumes has to be closed on the market again before delivery begins. Unpredictable production losses due to technical reasons and their effects on revenues must be documented separately. The same applies to sales portfolios with their delivery obligations to end customers. In these portfolios, electricity trading assumes the volume and structural risks in return for compensation for the corresponding premiums. If the volumes covered deviate from the contractual volumes to be supplied, a speculative position is opened.

We recognize that the distinction between asset-backed and prop trading is discretionary and that the allocation can change retrospectively as long as the classification at the time of entering into the transaction can be adjusted. This is why the declaration of a trading transaction to the management plays an important role. Without complete, unambiguous and non-adaptable declarations of the individual trading transactions for asset-backed and prop trading, risk controlling and, as a result of management, auditable reporting is not possible from our point of view. The comparison of the electricity companies is also limited if the consistency of the distinction between asset-backed and prop trading is not guaranteed.
The statement by some market players that *prop trading* also generates profits points to in particular the *arbitrage opportunities* in the energy markets and the continuing *market inefficiencies* in these markets. In Finance, arbitrage transactions are defined as portfolios of those trading transactions which i) are closed simultaneously, ii) generate positive proceeds in total and iii) do not show any risk exposure. This means that neither price risks nor counterparty risks nor volume risks exist in this *arbitrage portfolio*. In our view, there are no *arbitrage portfolios* in this strict form: since counterparty risks are excluded, there are no OTC platforms, but only exchanges which assume the counterparty risk. On these energy exchanges there are *transaction costs* of 10-20 bp depending on market liquidity. *Market inefficiencies* on exchanges exist only marginally and are of very short duration. Under the additional condition of closing trading transactions *at the same time*, we believe that no *transaction costs* can be profitably overridden without risk. If, contrary to our assumption, such *arbitrage transactions* should exist, this may be proven to company management by means of targeted filtering of historical trading transactions from electricity trading.

We calculate *transaction costs* at 20 bp for single-A rated energy traders and 40 bp for triple-B rated energy traders. For comparison, we refer to [22], in which the *transaction costs* for Swiss blue chips on SIX and four other electronic trading platforms lie within a range of 3-10 bp.

*Netting agreements* between counterparties are also of great importance in energy trading. These are concrete measures that massively reduce the overall balance. As a result, overall capital profitability and the equity ratio increase. Defaults by counterparties generally result in closed trading positions suddenly being *open* again. This means that massive *netting* de facto conceals a large volume and price risk: the trading positions that are *open* again require a further liquidation in line with their volume; the corresponding price risk is determined by the measurable volatility of the underlying transactions and the number of trading days after the first settlement, which is *unknown* before the default. A correct assessment of the risk exposure on the basis of the consolidated financial statements is therefore not readily possible with massive *netting*. In any case, it is insufficient to quantify the risk exposure solely on the basis of the net volume defined with the counterparty. Otherwise, the default of a counterparty and effects on the aforementioned risks are not taken into account.

In the context of managing credit and counterparty risks, the same principle applies that the limits for trading volume with a counterparty are based on creditworthiness or rating. The lower the credit rating, the smaller the maximum permissible trading volume with the counterparty. If a counterparty loses the *investment grade*, the trading positions must be eliminated as a rule. This also applies to closed trading positions that are no longer *de facto* exposed to market price risk. For this purpose, there is the so-called *portfolio compression*. This means that even without a counterparty’s loss of creditworthiness, the intention is to *cancel partial-portfolios* so that they no longer appear on the balance sheet. This reduces the trading volume and creates space for new trading transactions. In principle, this is in the interest of all parties involved. However, since *portfolio compression* also favors cash flows, the liquidity planning of the individual counterparties is of great importance. This will then define the conditions under which this *elimination round* will take place. This means that *portfolio compression* can result in different costs for different counterparties.
As a rule, several counterparties are affected in one elimination round for a portfolio compression. The reason for this is that various trading transactions that are considered closed are spread over several counterparties.

In addition to improving the financial balance through netting, electricity companies also have the freedom to report their results in their income statements. In contrast to the balance sheet, however, changes in value are not net here, but are preferably reported gross. If the value of an energy derivative increases in trading, this leads to sales revenues, even if the offsetting transaction leads to matching expenses of the same amount. As a result, the turnover rate of the capital employed increases, but without value added.

4. Methodology: Assumptions and Approach

With the liberalization of the European electricity markets in 2000, the parameters for Swiss electricity producers have changed considerably a number of times. Price erosion and the policy of promoting renewables are undisputedly the main factors weakening the profitability and thus the competitiveness of Switzerland’s large-scale hydropower industry. The extent to which a lack of a framework agreement with the EU, and consequently a lack of an electricity agreement, affects Switzerland negatively is politically controversial even within the Swiss electricity industry. This may come as a surprise, especially as the intra-European market coupling in 2010 brought together the Swiss neighboring countries France, Germany/Austria together with their neighboring market areas the Netherlands, Belgium and Luxembourg to form the so-called Central Western Europe (CWE) market region, thereby significantly facilitating cross-border electricity trading. Nevertheless, Swiss electricity producers still rate the opportunities in electricity trading with Italy better ([21]).

In [9], we analyzed the revenue potential of Swiss large-scale hydropower since the start of partial liberalization in Switzerland in 2009, as part of a commission from the Intergovernmental Conference of Mountain Cantons [9]. In this first step [9], we relied on the Swiss spot market and in particular on the day-ahead market as well as on the additional opportunities in short-term cross-border electricity trading with Switzerland’s neighboring countries. In order to assess these opportunities, we focused in [9] on the market area Germany/Austria within CWE. We have not included the more lucrative electricity trading with Italy. The core idea is to support the quantification of opportunities in market areas with a cheaper price level (such as Germany within CWE) than in a market area with a higher price level (such as Italy).

The marketing of large-scale Swiss hydropower takes place in the trading units of the major Swiss electricity producers as part of asset-backed trading. As a result of the results reported in [9], in a second step we took a more critical look at the reporting on electricity trading in the financial and annual reports of the major Swiss electricity producers (namely Alpiq, BKW and Axpo) (see [10]). An initial exchange with representatives of the Swiss electricity industry subsequently led to further follow-up work [11] on the role of Swiss electricity trading. In it, we compare the potential profit share from asset-backed trading with the EBIT from energy trading published for the 2014-2018 financial calendar years. The potential profit share from asset-backed trading is estimated in [11] on the basis of the factors used to determine the revenue potential, broken down by Swiss day-ahead market, hedging transactions, asset-backed spot trading
Within Switzerland (including the market for system services) and cross-border with neighboring countries, as well as *asset-backed electricity trading on futures and forward markets.*

Within this work we now want to broaden our approach covering the whole production park of the three major electricity producers and consider our assumptions, as well as quantify their sensitivities to the observed results in general.

**Approach**

Within the *Swiss large-scale hydropower sector*, we focus on storage power plants and run-of-river power plants. The WASTA data [2b] provide the turbine outputs as well as the average annual production of the hydropower plants. From the Swiss electricity statistics 2017 [2a] we find the historical production for the hydrological years 2008/09-2017/18 separately for *storage and run-of-river power plants, thermal and nuclear* production and this is reported separately for summer and winter periods.

For our electricity prices we use the historically auctioned hourly day-ahead prices *Swissix* for the market area Switzerland for the last 10 years (2008-2018). Thus, daily, weekly, monthly and quarterly seasonalities are taken into account in the historical *Swissix* price curve.

According to SFOE 2018 [2e], the **profitability** of the power plants is defined as *revenue less the full production costs*, which in our opinion also includes revenue from *asset-backed trading*. For the **intrinsic value** (in Rp./kWh) of the power plants, we need the *EBIT-relevant production costs*, which we get by deducting the components *equity- and debt capital costs, imputed profits and profit taxes* from the *total production costs*. Based on the cost structures of Swiss large-scale hydropower (Filipini 2015 [8]), the SFOE 2018 [2e] reports the individual components of the production costs (in Rp./kWh) from the perspective of the hydropower operators, and from the perspective of the SFOE, on the basis of values partially corrected downwards. We determine the **intrinsic value** (in Rp./kWh) of a power plant as the difference between the *revenue on the Swiss day-ahead market* (in Rp./kWh) and the *EBIT-relevant production costs* (in Rp./kWh), whereby we base the figures for large-scale hydropower on the values from the perspective of the hydropower operators in SFOE 2018 [2e]. To determine the **intrinsic value** (in Rp./kWh) for *thermal and nuclear* power plants, we refer to Akademien der Wissenschaften Schweiz 2012 [1] and to Koste et al. 2018 [13].

In its Financial Report 2017/18 [4], *Axpo* announced that the first sale is decisive for the sales revenue of electricity production, which *in fact* also includes the hedging success: All downstream trading transactions, which serve to optimize the use of power plants, are *now managed as energy derivatives* and are therefore included in the current annual result with an effect on net income. This means that hedging transactions will also be integrated. With this in mind and while maintaining comparability, we distinguish the **intrinsic value** of the power plants from both the *hedging success* and the success of the *asset-backed trading transactions* in the spot and forward markets.
Figure 1a presents the development of the spot base (CHF/MWh) over a fiscal year. In 2009 it is noticeable that within the two balance sheet dates there is a difference of more than 10 CHF/MWh, which leads to a correspondingly large difference in the hedging successes on the two balance sheet dates. As part of hedge accounting, the expected changes in value of the hedging transactions for subsequent years as of the balance sheet date are shown. This alone does not indicate how much production (long position) or delivery obligation (short position) has been hedged. If we include a rolling hedging strategy over 3 years as a benchmark (Figure 1b), its replacement value at the balance sheet date (Figure 1c) can be used to approximate the energy volume of the hedging portfolio and the sign to determine whether a long position or a short position has been hedged.
Based on a rolling 3-year hedging strategy, which is also common in practice and requires hedging of the entire production for the following year, 2/3 of the production for the second following year and 1/3 of the production for the third following year as of the balance sheet date, twice the annual production would have to be hedged as of the balance sheet date. This hedging strategy serves as a benchmark strategy for performance in electricity trading and as a distinction between asset-backed trading and prop trading.

Run-of-River Power Plants

In the case of run-of-river power plants, we do not distinguish between high-pressure and low-pressure run-of-river power. From the seasonal historical production volumes of run-of-river power ([9]), we calculate the approximate weekly production volumes, which are subsequently evaluated as a weekly volume delivery. For this weekly volume delivery, the volume-weighted average over 52 weeks of a hydrological year is calculated and reported as a Base (D-A) (in Rp./kWh) in Table 1a for the balance sheet of September 30.

Table 1b follows the same procedure for the calendar year; the figures thus refer to the balance sheet of December 31. Numerically, this indicator Base (D-A) is very close to the yearly base Swissix. Any difference between these two values quantifies the influence of seasonality on run-of-river production.
In addition, we show the hedging successes of the *hedge base* of production (Table 1a, 1b). We use a rolling hedging strategy that markets the annual production of the fourth subsequent year with base futures evenly distributed over three years until the beginning of the delivery year. These hedging successes were reported in CHF, which also includes currency effects. This key figure, *hedge base*, represents the historical profit generated in the delivery year and included in the annual result as of the balance sheet date, provided that this hedging strategy is implemented by means of *base futures* until the start of the delivery year (Figure 1b).

Finally, we determine the revenue potential of the *AbT future* that can be realized within *asset-backed trading* by monetizing the volatilities in the futures and forward markets. The historical volatilities of the *base futures* are documented in [10]. The development of this *AbT future* factor is essentially determined by the annual volatility of the *futures*.

As we make no distinction between high-pressure and low-pressure run-of-river power, any flexibility premiums in connection with the management of daily reservoirs are also eliminated. Similarly, we did not take into account the fact that run-of-river power is also qualified as a provider of *SDL* (especially for negative balancing power) when estimating revenue potential.

### Storage Power

For the storage power plants, we calculate the weekly production quantities analogously as in [2a]. On the basis of the historical hourly price forward curves [26] and the available capacity of the storage power plants ([2b]), we determine the weekly trigger prices, the price threshold above which it is economically justified to use the power plant turbine, taking into account storage levels, turbine capacity and weather forecasts. The weekly revenues from physical delivery are based on estimated hourly production from storage power and historical hourly
Swissix prices. The sum of the volume-weighted weekly revenues for the hydrological year is shown under Peak (D-A) (in Rp./kWh) in Table 2a.

<table>
<thead>
<tr>
<th>Storage Power Plants (Balance Sheet as of September 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rp./kWh</td>
</tr>
<tr>
<td>Peak D-A</td>
</tr>
<tr>
<td>Hedge Peak</td>
</tr>
<tr>
<td>AbT-Spot</td>
</tr>
<tr>
<td>AbT-Future</td>
</tr>
<tr>
<td>Total Revenue</td>
</tr>
</tbody>
</table>

*Table 2a: Historical revenue (Rp./kWh) for storage power plants WITH access to European cross-border electricity trading as of balance sheet date September 30 / Calculations by ior/cf-HSG based on EEX, Epex-Spot; excluding trading with guarantees of origin.*

Table 2b follows the same procedure for the calendar year; the figures thus refer to the balance sheet date of December 31. Numerically, this key figure peak (D-A) is very close to the annual peak of Swissix. Any difference between these two values quantifies the influence of seasonality in storage power production and the proportion of the most expensive hours within peak quality.

<table>
<thead>
<tr>
<th>Storage Power Plants (Balance Sheet as of 31.12.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak D-A</td>
</tr>
<tr>
<td>Hedge Peak</td>
</tr>
<tr>
<td>AbT-Spot</td>
</tr>
<tr>
<td>AbT-Future</td>
</tr>
<tr>
<td>Total Revenue</td>
</tr>
</tbody>
</table>

*Table 2b: Historical revenue (Rp./kWh) for storage power plants WITH access to European cross-border electricity trading as of balance sheet date December 31 / Calculations of ior/cf-HSG based on EEX, Epex-Spot; excluding trading with guarantees of origin.*

In addition, we show the hedging successes of a production hedge peak (in Rp./kWh). We again use a rolling hedging strategy that markets the annual production of the fourth consecutive year with peak futures evenly distributed over three years until the start of the delivery year. These hedging successes are shown in CHF in order to include the currency effect. This key figure, hedge peak, represents the historical success achieved in the delivery year and included in the annual result as of the balance sheet date, provided that this hedging strategy is implemented by means of peak futures up to the beginning of the delivery year.

The AbT Spot parameter in Tables 2a and 2b represents the potential added value of flexible storage capacities that can be generated within the framework of opportunities in cross-border electricity trading between Switzerland and its neighboring countries or within the Swiss market area. The marketing of system services in Switzerland and in the other European market areas is also taken into account. Technically, we have estimated this potential added value on the basis of the option price theory [17] by taking the price dynamics of a representative market area (Germany) as a basis, including border auction prices and a volatility of 150%, which is below the average of empirical observations ([9]).
Finally, we report the revenue component *AbT Future* (in Rp./kWh) that is potentially achievable within *asset-backed trading* in the futures markets by monetizing *peak futures* volatilities. The historical volatilities of the peak futures are documented in [10].

Market players discussed the fact that in this approach run-of-river shares in the storage power plants are not taken into account. These run-of-river shares can amount to up to 30%, whereby 30% of the storage energy would have to be valued at the average day-ahead revenue of the run-of-river power plants reduced by approx. 28% from Tables 1a and 1b. We have used the gross storage energy to determine the weekly trigger prices. If we reduce this gross storage energy by a 30% run-of-river share, we get the *flexible storage energy*, which is lower. Lower, *flexible storage energy* can be produced in fewer but more expensive hours. This results in increased trigger prices and higher day-ahead revenues. We have calculated, taking into account the historical hourly *Swissix* auction prices, that the day-ahead revenues with the flexible storage energy are approx. 5% higher. Thus, a reduction of 28% in value (volume-weighted at 0.3) is offset by an increase of approx. 5% in value (volume-weighted at 0.7). This results in an *intrinsic value* (Rp./kWh) for the storage power, which is approx. 4.9% (= 8.4 - 3.5) lower assuming a 30% run-of-river share within a storage power plant. To be clear, it should be mentioned that this correction is about half as much if there is only 15% run-of-river share.

We further conclude that the two revenue factors *hedge peak* and *AbT future* listed in Tables 2a and 2b do not require corrections, as these are negligible over time due to their marginal differences from the *base*-related parameters. As far as the *AbT-Spot* parameter is concerned, it can be applied to gross storage energy, because in the spot market, due to its high volatility, only about 23% of trading transactions lead to a physical delivery and thus in 77% of cases the energy in the storage is not influenced. If we assume a 30% share of run-of-river, then 70% of flexible storage energy remains, which in turn statistically gives a safety margin of approx. 99%, actually not more than the available *flexible storage energy*.

Power plant centers within storage power plant parks, most of which have run-of-river turbines, are listed in the WASTA data as run-of-river power plants. In this case, a differentiation is made because we have assigned the resulting electricity production to the run-of-river power plant and evaluated it accordingly using the parameter *Base* (D-A) from Tables 1a and 1b.

The *AbT-Spot* indicator also includes the shares of revenue from *system services* both in the Swiss market area and in neighboring and other market areas in the EU. For the quantification of this contribution, we have relied on the Swiss controlled area. We assumed that approx. 20% of the storage power plant capacities would be held in reserve in order to be able to produce balancing energy on demand (approx. 1 TWh in the Swiss controlled area) (Figure 2a).
In [10,11] we based our calculations on Swissgrid’s 2009-2018 financial reports and calculated the revenue share (in Rp./kWh) from *system services* less the market value of balancing energy on storage production. In this sense, the run-of-river shares of the storage power that are auctioned for *SDL* products and lead to balancing energy are included in the valuation. We consider any inaccuracies in this regard to be marginal and unsystematic (in the sense that any upward and downward swings are compensated).

We did not take into account the added value of the pumping capacities in the context of spot trading and the market for *SDL*. The corresponding parameter *AbT spot* for pump capacities is roughly the same as that for turbines. The differences lie only in the significantly higher frequency (77%) of a physical delivery compared to a turbine (23%). Weighted with the
purchased pump energy of approx. 2.0-2.5 TWh, this value over the period 2009-2018 is somewhat higher than the cost range of 0.18 to 0.25 Rp./kWh stated in SFOE 2018 [2e].

In recent years, competition for these system services has intensified due to the continued evolution of the market for system services. Other technologies, such as battery storage and large-scale consumers bundled as virtual power plants, are qualified system services. If, for these reasons, storage power is less popular for system services, then this is also due to the optimization of the opportunity costs of electricity trading on the part of traders. This increases the opportunities for electricity traders, as storage power plants can still be used for cross-border spot trading. In our view, this increases the revenue potential of asset-backed trading. It is a natural consequence that some market players are not interested in redirecting their system service products towards storage power capacities. Too much emphasis is placed here on their own competitive advantage.

In summation, there are two effects for storage power plants: If we assume that flexible storage energy will be reduced by 30% compared with gross storage energy, the trigger prices and thus also the revenue factors on which Swissix is based in the more expensive hours for the Swiss market area will increase. The revenue factors of the corresponding run-of-river power plants from Table 1 would now be applicable to the run-of-river shares of the storage power plant. This spread weighted by 30% (corresponding to the assumed run-of-river share in the storage power plant) and the increase in day-ahead revenue factors for flexible storage energy weighted by 70% leads to a total intrinsic value reduced by approx. 4.9%. We refrain from further differentiating whether and to what extent the run-of-river share of the storage plant is turbinated within the framework of an SDL product, as the compensation for SDL products is significantly higher and the correction of 4.9% would therefore be more likely weakened.

In Hecker et. al 2015 [12] the flexible storage capacities for market areas Germany, Norway and Austria are estimated by subtracting the historical run-of-river shares from the hourly electricity production of a market area. These also include the volumes that are produced as part of system services. Switzerland’s flexible storage capacities are in competition with those in Germany and Austria. This competition is spread across all European market areas, in particular those in the neighboring countries of Germany and Austria.

In Hecker et. al 2015 [12] - in contrast to our analyses in [9] - no assessments of flexible capacities were made. Due to the objective of separately quantifying the revenues from SDL and from short-term electricity trading, we have decided to proceed in [9]. Knowing that internal company data applied to our approach allows for verification and, as a consequence, precision.

We take the above considerations into account by using a run-of-river share of 30% within the storage power plants as a basis for estimating the trading income from prop trading of the three major Swiss electricity producers in Section 5.

Production of Nuclear Energy

For nuclear power plants, we determine the intrinsic value from the base figure (D-A) minus the EBIT-relevant production costs, which we set at 5 Rp./kWh, with reference to the full production costs of 7.10 Rp./kWh, which lie within the range of 6.4-8.0 Rp./kWh [1]. The electricity
production costs are considered stable [1], which means that we include the hedging of the electricity price and the monetization of volatilities in the futures markets as part of asset-backed trading.

For supply contracts and long-term contracts, we calculate the intrinsic value from the Base (D-A) minus the EBIT-relevant production costs, which we calculate at 5.5 Rp./kWh, with reference to the full production costs of 6.4-8.0 Rp./kWh for nuclear production [1]. We assume that price hedging clauses are included in the design of the long-term contracts and thus also form part of our estimated EBIT-relevant production costs. As a result, we do not include supply contracts in the volume to be hedged.

Production of Thermal Energy

For gas-powered plants or combined cycle power plants, we calculate the intrinsic value from the Peak (D-A) parameter in Tables 2a and 2b minus the EBIT-relevant production costs, which we derive on the basis of [13] and the gas and CO2 prices in 2008-2009 and set at rounded 8 Rp./kWh, again excluding capital costs, imputed profits and profit taxes.

We neglect the flexibility of gas and steam power plants for spot market trading or for system services, as this type of power plant must be in operation for a minimum number of hours. As a result, the volatility of the average price decreases sharply with the minimum number of operating hours, which means that we rate the revenue potential in the spot market as significantly lower than for storage power capacities.

For conventional thermal power plants (coal-fired power plants), we calculate the intrinsic value from the base parameter (D-A) in Tables 1a and 1b less the EBIT-relevant production costs, which we set at 5 Rp./kWh on the basis of [1,13] and coal and CO2 prices in 2008-2009.

The management of thermal power plants is based on the integration of stochastic price dynamics for electricity, coal, gas and CO2. This dynamic includes in particular volatilities and correlations. We assume that by exploiting these volatilities and correlations, the intrinsic value is logged in by hedging the corresponding spreads in the futures markets until the start of a fiscal year. As a result, we see the AbT future as an indicator of the intrinsic value of the thermal power plant. In addition, we neglect additional asset-backed trading in the spot markets for thermal production, as this additional trading activity results in an opening of additional exposure to risk and we charge accordingly for speculative trading (proprietary trading, prop trading). In this way, we also neglect any potential fees from the provision of negative standard services as part of system services.

For the calculation of the intrinsic value, Swissix is used for the market area Switzerland, even if thermal power plants are located abroad. A large part of the foreign production is located in Italy, where higher market prices apply, which tends to underestimate the intrinsic value.
5. The Start of Limited Liberalization: The Financial Year 2009

If we look at the trend in electricity prices on the trading markets (Fig. 3), we can see that in 2009 electricity prices fell sharply from their highs in 2008, with high volatility. We also noted in [11] that, measured relative to the full production cost of the SFOE 2018 [2e], large hydropower plants excluding asset-backed trading, were highly profitable.

[Image: Development of futures prices on the EEX for 4 front years (Q1 05 - Q2 19).

In this section we would like to consider the trading results of the major Swiss electricity producers in greater detail for the 2009 financial year.

In order to explain the trading results, we reconstruct the EBIT from the business segments reported in the financial reports for 2009 using our analyses in [9,10,11]. We estimate the positive earnings contribution from asset-backed trading directly from the corresponding key figures in Tables 1 and 2. We derive the positive earnings contribution from the power plants from the day-ahead revenue in the Swiss market area (based on Swissix, Tables 1 and 2) less the EBIT-relevant production costs. As a reminder: the EBIT-relevant production costs are derived from the full production costs less equity and debt capital costs, imputed profits and profit taxes, which total 2.16 Rp./kWh with reference to SFOE 2018 [2e]. Using the reported perspective of the hydropower operators, we estimate the EBIT-relevant production costs of run-of-river hydropower for 2011 as rounded to 4.0 Rp./kWh and those of storage hydropower as rounded to 5.5 Rp./kWh.

A special role is played by overhead costs, which, according to Swisselectric [14], are compensated for by the trading units. In [14] these costs are assumed to be 0.9 Rp./kWh, according to SFOE 2018 [2e] they are expected to be 0.7 Rp./kWh by the hydropower operators, and SFOE [2e] considers 0.6 Rp./kWh to be justified. We used this component overhead costs in this range and based on this we derived our calculated values of 4.0 Rp./kWh and 5.5 Rp./kWh (rounded to 0.5 Rp.). For the 2009 financial year, this corresponds to full production costs of 6.16 Rp./kWh for run-of-river power and 7.66 Rp./kWh for storage power. With reference to Filipini...
we can say that the *production costs* for the 2009 financial year are lower than in 2011. In this context, it should be mentioned that water interest rates in 2009 were still CHF 80/kWb, and were thus around 35% lower in 2009 compared with CHF 110/kWb in 2011.

*In summation*, it should be noted that for our subsequent analyses, we assess the *EBIT-relevant production costs* conservatively in favor of the Swiss electricity producers.

**Key figures by type of power plant as of balance sheet date September 30, 2009**

Based on Table 1a, the *intrinsic value of run-of-river power* is 3.27 Rp./kWh, which is derived from the difference between the *Base D-A* parameter (7.27 Rp./kWh) and the *EBIT-relevant production costs* of 4.0 Rp./kWh and, analogous to Table 2a, an *intrinsic value* of 5.23 Rp./kWb for storage power plants from the difference between *Peak D-A* (10.73 Rp./kWh) and the *EBIT-relevant production costs* of 5.5 Rp./kWh based on SFOE 2018 [2e].

We quantify the *intrinsic value* (2.27 Rp./kWh) of a *nuclear power plant* as the difference between *Base D-A* (7.27 Rp./kWh) for base load energy (Table 1a) and the *EBIT-relevant production costs* (5.0 Rp./kWh) based on [1.13]. We quantify the *intrinsic value* (1.77 Rp./kWh) of a *supply contract for nuclear power or long-term supply contracts* as the difference between *Base D-A* (7.27 Rp./kWh) for base load energy and estimated *EBIT-relevant production costs* (5.5 Rp./kWh).

We calculate the *intrinsic value* (2.54 Rp./kWh) of a *thermal power plant park* as the difference between *Base D-A* (7.27 Rp./kWh) for base load energy (Table 1a) and imputed *EBIT-relevant production costs* (5 Rp./kWh) for 2009.

We calculate the *intrinsic value* (2.73 Rp./kWh) of a *combined cycle power plant* as the difference between *Peak D-A* (10.73 Rp./kWh) from peak load energy (Table 2a) and the imputed *EBIT-relevant production costs* (8.0 Rp./kWh) for 2009.

**Key figures by type of power plant as of balance sheet date December 31, 2009**

Based on Table 1b, *run-of-river power plants* have an *intrinsic value* of 3.54 Rp./kWh as a result of the difference between the *Base D-A* parameter (7.54 Rp./kWh) and the *EBIT-relevant production costs* of 4.0 Rp./kWh, as well as analogous to Table 2b an *intrinsic value* of 4.17 Rp./kWh for *storage power plants*, from the difference between the *Peak D-A* (9.67 Rp./kWh) parameter and the *EBIT-relevant production costs* of 5.5 Rp./kWh.

We calculate the *intrinsic value* (2.54 Rp./kWh) of a *nuclear power plant* as the difference between *Base D-A* (7.54 Rp./kWh) for base load energy (Table 1b) and the *EBIT-relevant production costs* (5.5 Rp./kWh). We calculate the *intrinsic value* (2.04 Rp./kWh) of a *supply contract for nuclear power or long-term supply contracts* as the difference between *Base D-A* (7.54 Rp./kWh) for base load energy and estimated *EBIT-relevant production costs* (5.5 Rp./kWh).

We calculate the *intrinsic value* (2.54 Rp./kWh) of a *thermal power plant park* as the difference between *Base D-A* (7.54 Rp./kWh) for base load energy (Table 1b) and the imputed *EBIT-relevant production costs* (5.5 Rp./kWh).
We calculate the *intrinsic value* (1.67 Rp./kWh) of a *combined cycle power plant* as the difference between *Peak D-A* (9.67 Rp./kWh) from peak load energy (Table 2b) and the imputed *EBIT-relevant production costs* (8.0 Rp./kWh).

**Clarifications on the volumes for the 2008/09 and 2009 financial years respectively**

Due to weather and availability, production volumes are sometimes subject to large fluctuations that can rarely be anticipated. This gives rise to volume risks, which also have to be taken into account. With the definition of the hedging volume three years before the delivery period, this affects the implementation of the *hedging strategy* on the one hand and, as a direct consequence, *asset-backed trading in forward markets* to monetize volatilities on the other. With reference to the SFOE statistics [2a], the deviation of hydropower production from the annual average in the financial year 2009 is approx. 5%, and for electricity production from nuclear power we take a deviation from the annual average of less than 1%. We note that these effects only marginally influence our core assessments for the 2008/09 and 2009 financial years, which is why we do not include them completely in our numerical evaluations. This is necessary in order to maintain manageable and easily verifiable results.

According to SFOE statistics [2a], the published production volume of hydropower is divided into 55% storage power production and 45% run-of-river power production. For the *assessment of storage energy* and *asset-backed trading* in the *spot market*, we take into account 30% of run-of-river share in the storage power plants, which *de facto* results in a distribution of 38.5% : 61.5% in favor of run-of-river power. We take these uncertainties in the volumes of storage power into account by basing our calculations exclusively on *flexible storage energy* and thus - as suggested by the market players - adopting a conservative approach.

Also to be taken into account is energy sales in the base supply, where electricity prices for bound end customers in 2009 were 2 Rp./kWh below the rounded market price. This affects *CKW* as a subsidiary of *Axpo* and *BKW* [16]. We used the *Enerprice Study 2018* [23] to calculate the price difference of 2 Rp/kWh for the average end customer price (8.4 Rp/kWh) and replicated the relevant market price with the rolling hedge over 3 years. Taking the *Base* and *Peak* qualities into account, the price difference for both balance sheet dates (September 30, 2009 and December 31, 2009) is approximately 0.5 Rp./kWh higher than in the *Enerprice* study.

**5.1 The 2009 financial year for Alpiq (balance sheet date December 31, 2009)**

In 2009, *Alpiq* [3] pooled its earnings from *Production, Tading and Sales* in the *Energy Division* and reported total *EBIT* of CHF 1003 million. According to the Financial Report 2009 [3], *Alpiq* produced 6.6 TWh from *hydropower*. Hydropower production is divided into *flexible storage power* (2.5 TWh) and *run-of-river power* (4.1 TWh).

*Alpiq* produced 6.5 TWh *conventionally thermally*, distributed across Switzerland, Italy and Hungary/Czech Republic in the ratios of approx. 25%, 50% and 25%. The *nuclear power plants* add 6.2 TWh to the production volume. *Alpiq* also has *long-term supply contracts* for 15.5 TWh.
In total, Alpiq produced and procured 34.8 TWh of electricity in 2009. Alpiq does not report any significant sales in the base supply [16], which is why no adjustment must be made to the market value of the physical delivery or the hedged production volume.

**Alpiq 2009: EBIT contribution from production (CHF 888 million)**

The intrinsic value for run-of-river power (3.54 Rp./kWh) applied to 4.1 TWh results in an EBIT share of 145.1 million.

The intrinsic value for flexible storage power (4.17 Rp./kWh) applied to 2.5 TWh results in an EBIT share of 104.3 million.

The intrinsic value for nuclear production (2.54 Rp./kWh) applied to 6.2 TWh results in an EBIT share of 157.5 million.

The intrinsic value (2.04 Rp./kWh) for long-term supply contracts applied to 15.5 TWh results in an EBIT share of 316.2 million.

In summation, for Alpiq this results in a positive earnings contribution from production and procurement of CHF 888.2 million.

**Alpiq 2009: EBIT contribution from hedging (CHF 420 million)**

In 2009, Alpiq reported total production (including procurement contracts) of 34.8 TWh. In that we assume that any hedging elements in the management of thermal production (6.5 TWh) and the procurement contract for nuclear power (15.5 TWh) are included, we believe that Alpiq's production volume to be hedged is 12.8 TWh, consisting of 2.5 TWh of flexible storage energy and 10.3 TWh of base load energy.

The hedging revenue (3.55 Rp./kWh, Table 2b) for flexible storage energy 2.5 TWh on the basis of a benchmark with peak futures rolling over 3 years results in an EBIT share of 88.8 million

The hedging revenue (3.22 Rp./kWh, Table 1b) for base load energy 10.3 TWh (excluding thermal production and supply contracts) on the basis of a 3-year rolling benchmark with base futures results in an EBIT share of 331.7 million

**Alpiq 2009: EBIT contribution from asset-backed trading in spot markets, incl. SDL (CHF 113 million)**

Asset-backed trading in (cross-border) spot trading (AbT spot 4.52 Rp./kWh in Table 2b) generates an EBIT share of 113.0 million for 2.5 TWh of flexible storage energy.
**Alpiq 2009: EBIT contribution from asset-backed trading in forward markets (CHF 104 million)**

*Asset-backed trading in forward markets (AbT future 1.08 Rp./kWh, Table 2b)* generates an EBIT share of 27.0 million for 2.5 TWh of flexible storage energy. *Asset-backed trading in forward markets (AbT future 0.75 Rp./kWh, Table 1b)* yields an EBIT share of 77.3 million for 10.3 TWh of base load energy.

**Plausibility check and reflection of Alpiq’s 2009 annual results**

Overall, the sum of the above EBIT components results in an estimated EBIT potential of 1,526 million. This amount does not include transaction costs in energy trading. In 2009, *Alpiq* reported a rounded gross cash flow of CHF 27,000 million from traded energy derivatives. If we assume at least a Single A rating for *Alpiq* in 2009 and thus transaction costs of 20 bp, the total transaction costs would amount to CHF 54.0 million. Including these transaction costs, we estimate *Alpiq’s* existing EBIT potential of CHF 1,472 million for the 2009 financial year.

In *Alpiq’s* Financial Report 2010 [3], the Energy business segment for the 2009 financial year is subdivided into the segments *Energy Switzerland* (EBIT 512 million), *Energy Western Europe* (EBIT 182 million), *Energy Central Europe* (EBIT 201 million) and *Trading & Services* (EBIT 127 million). This results in a total revised EBIT of CHF 1,022 million for the 2009 financial year. This includes an EBIT of CHF 895 million for production (incl. procurement from long-term supply contracts) across Switzerland, Western Europe and Central Europe.

We are now referring to the EBIT of 1,022 million derived from *Alpiq’s* 2010 Financial Report [3]. With *Alpiq’s* EBIT for 2009 revised in 2010, the result at EBIT level compared with our estimated EBIT of CHF 1,472 million is an unexplained negative trading profit of approximately CHF 450 million.

Following, we document our understanding of this unresolved negative trading income of CHF 450 million.

The rolling hedging of electricity production over a period of 3 years has generated a profit of CHF 420 million for a production volume of 12.8 TWh to be hedged by *Alpiq*. We define deviations from the hedging strategy as speculative trading (proprietary trading, prop trading). *Alpiq* reports EBIT of CHF 127 million for its *Trading & Services* segment. This shows that, measured against our hedging benchmark, *Alpiq’s* energy trading (prop trading) may have overstated its hedging with speculative trading transactions in proprietary trading (prop trading). As a result, *Alpiq’s* proprietary trading has led to a negative contribution to *Alpiq’s* trading income. We now want to estimate this negative contribution to earnings from prop trading.

Including our estimated positive earnings contribution (CHF 217 million) from asset-backed trading, the loss in proprietary trading amounts to CHF 510 million (=127-420-217 million). Assuming that half of the CHF 217 million was realized by *Alpiq’s* asset traders, the loss in proprietary trading amounts to CHF 402 million. We estimate the loss from *Alpiq’s* prop trading is thus between 402 and 510 Mio.
In the context of clarifying the negative trading contribution from proprietary trading, we would also like to discuss some additional items in Alpiq’s financial reporting for the 2009 financial year:

i) In the segment reporting, a loss of CHF -22 million is reported under hedging. For the rolling hedging of a long position over 3 years, we calculated a positive trading result of +32.2 CHF/MWh (Table 1b) on the basis of base futures and +35.5 CHF/MWh (Table 2b) on the basis of peak futures as of the balance sheet date December 31, 2009. These values refer to the hedging of a generated MWh and thus to the hedging of a long position. These figures show the extent to which electricity prices have fallen on average over the last 3 years. If Alpiq now reports a negative hedging result of CHF -22 million, this can be explained by a peak delivery of about 0.6 TWh, which was covered in excess as part of the hedging of a short position (as part of the delivery obligation) and had to be sold back to the market at lower prices in the 2009 financial year.

ii) Alpiq has no hedge accounting for energy hedging in its Financial Report 2009. We would remind you that hedging transactions do not necessarily have to be included in hedge accounting. Nor does segment reporting necessarily have to reflect the actual hedging result. Hedging successes can a) be realized before the balance sheet date, for example if the hedging instrument is settled, as reported in 2009 as a hedging loss of -22 million, or b) recognized in the replacement values of the energy derivatives.

iii) The energy derivatives include all trading transactions that cover short-term trading. Hedging positions may also be included, but are not shown separately as such. Looking at the balance sheet items, assets and liabilities, of Alpiq’s balance sheet, it is noticeable in the 2009 financial year that energy derivatives on the assets side have a replacement value of +1,240 million and energy derivatives on the liabilities side a replacement value of -1344 million. There is therefore a surplus of -104 million on the liabilities side, which means that there are open positions of this amount.

(iv) Energy derivatives may generally have highly non-linear payout structures and therefore the amount and sign of the overhang alone do not define how the trading unit will position itself vis-à-vis the market for the new financial year. If, however, it is assumed that the majority of energy derivatives are characterized by linear payout structures, the replacement value of the 3-year rolling hedging strategy can be used to determine the direction and hedging volume with which management and group management would like to start the new fiscal year vis-à-vis the public.

v) If we now take for Alpiq the surplus of liabilities in the position amounting to -104 million and the replacement value of the hedging strategy amounting to +18 CHF/MWh as of December 31, 2009, based on the front-end futures for delivery in 2010, we calculate approximately minus 6 TWh. This means that Alpiq has hedged a short position of approximately 6 TWh across its entire energy derivatives portfolio. In terms of value, this means that by the balance sheet date Alpiq had purchased 6 TWh more from the market than its sales volume for subsequent years reported.
vi) With the hedging loss of minus 22 million reported in the financial statements, approx. 1.25 TWh were resold at a lower price (a total of 22 million lower); in the balance sheet items an energy surplus of 6 TWh in short position was maintained. There can be two reasons for this: (1) Closing the 6 TWh short before the balance sheet date would have had an additional negative impact on the 2009 annual result. This would have meant that hedging gains not affecting income would have had to be reclassified to the income statement. The management wanted to avoid this. (2) Management and electricity trading are of the opinion that prices will rise, so that this position of 104 million (energetically short) corresponds to speculation of rising prices.

vii) The 2008 balance sheet does not report any external information on the 2009 financial year either, as the energy derivatives balance sheet item is almost equal in terms of assets and liabilities. Actually, at the end of 2008, 1,159 were reported on the assets side and 1,155 on the liabilities side of the balance sheet. Whether and to what extent hedging transactions for production were included in the 2009 annual result with an effect on income would require at least an understanding of net trading revenue, which, however, is not reported by Alpiq for the 2009 financial year.

viii) It is possible that in the segment reporting the positive income of CHF + 33 million reported under proprietary trading (prop trading) resulted from trading transactions which represented a (small) part of the rolling hedging strategy (outside of hedge accounting). This success could also be part of those asset-backed trading transactions in the spot markets that do not lead to physical delivery.

In the Alpiq case, therefore, there is a lot to suggest that Alpiq - to put it very offensively - made a bet at the time that electricity prices on the exchanges would not drop. In fact, as of December 31, 2009, base prices had fallen by CHF 32.2/MWh and peak prices by CHF 35.5/MWh compared with the benchmark of our 3-year rolling hedge. At that time, the term structure of the futures was in low contango, which means that prices for later delivery periods have a significant premium over earlier delivery periods. This term structure is often seen by traders as a sign that prices are rising. Empirically, however, this connection is not confirmed. It remains a speculation to bet on rising prices in contango.

We explain the difference between Alpiq’s reported EBIT (CHF 1,022 million) and our estimated EBIT adjusted for transaction costs (CHF 1,472 million) with a loss from proprietary trading (prop trading) of between CHF 402 and 510 million, depending on Alpiq’s asset traders’ contribution to earnings. Relative an equity of CHF 7,930 million, the loss from proprietary trading amounts to approx. 6%.

What remains for us is the summary insight that timing and direction of hedging as well as hedging volumes define the success of a hedging strategy. Furthermore, proprietary trading (within energy trading) can overshoot hedges and thus destroy a large part of the hedging success.

Alpiq’s contract volume as of December 31, 2009 was approximately 55,000 million, compared with a market value of annual production of roughly 1,500 million in 2009. This means that Alpiq’s contract volume for energy trading corresponds to 36 times its annual production.
Any positive earnings contributions from a sales portfolio managed by Alpiq in the Trading & Services segment would increase the loss in prop trading accordingly. This additional effect has not been included in our estimated range of CHF 402-510 million, which we see as the loss from Alpiq’s prop trading.

Finally, if we look at the depreciation of CHF 423 million reported in Alpiq’s Financial Report 2010 [3], a total of 34.8 TWh from production and long-term purchases amounts to 1.22 Rp. per kWh. This corresponds to a range of 1.2-1.3 Rp./kWh, which we have used as the basis for depreciation in accordance with SFOE 2018 [2e]. This allows us to conclude that our estimated loss for Alpiq’s prop trading at EBITDA and EBIT levels in the 2009 financial year is the same.

5.2 Axpo in fiscal year 2008/09 (balance sheet date as of September 30, 2009)

In 2008/09 Axpo Holding reported its production, trading and sales figures in the annual results of its three subsidiaries (Axpo AG, CKW and EGL) (2008/09 Annual Report of Axpo, [4]). At the time, EGL was responsible for European energy trading and, to a certain extent, for the management of power plants. In that Axpo AG also had a Trading and Sales division, but reporting was not sufficiently differentiated, we focus on the relevant key figures from Axpo’s balance sheet and consolidated financial statements in the Financial Report 2008/09 [4]. Based on the 2008/09 Annual and Financial Report [4], the EBIT of Axpo AG (CHF 385 million) and CKW (CHF 136 million) as well as the EBIT of the trading subsidiary EGL (CHF 330 million) are the key figures for us.

According to the 2008/09 Annual Report [4], Axpo produced 8.9 TWh from hydropower. We divide hydroelectric production into flexible storage energy (3.4 TWh) and run-of-river (5.5 TWh). In addition, Axpo produced 6.9 TWh of conventional thermal energy, mainly in Italy, from combined cycle power plants. The nuclear power plants generate 22.3 TWh, of which 9.1 TWh are procurement contracts from nuclear power plants. In the 2008/09 financial year, Axpo produced and procured a total of 38.1 TWh.

In addition, we report a sales volume of 6 TWh rounded by CKW, which we see as a delivery to the basic supply and therefore 2 Rp./kWh lower than the market price for Swissix.

Axpo 2008/09: EBIT contribution from production and sales (CHF 887 million)

The intrinsic value for run-of-river power (3.27 Rp./kWh) when applied to 5.5 TWh yields an EBIT share of 179.9 million

The intrinsic value for flexible storage energy (5.23 Rp./kWh) when applied to 3.4 TWh results in an EBIT share of 177.8 million

The intrinsic value for nuclear production (2.27 Rp./kWh) applied to 13.2 TWh results in an EBIT share of 300.0 million

The intrinsic value (1.77 Rp./kWh) of a procurement contract for nuclear power when applied to 9.1 TWh results in an EBIT share of 161.1 million
The intrinsic value for combined-cycle power plants (2.73 Rp./kWh) when applied to 6.9 TWh results in an EBIT share of 188.4 million.

Through its subsidiary CKW, Axpo reported sales of 6.0 TWh, which we attribute to the basic supply. This means that Axpo’s positive contribution to earnings from production will be reduced by CHF 120 million, as deliveries to bound end customers in 2008/09 are approx. 2 Rp./kWh below the market price.

In summation, this results in a positive contribution to Axpo Holding’s result from production and sales of approximately CHF 886.8 million.

**Axpo 2008/09: Contribution to EBIT from hedging (CHF 391 million)**

In 2008/09, Axpo reported a total production (including procurement contracts) of 38.1 TWh. After deducting the 6 TWh share of the basic supply, 32.1 TWh remain. Since, according to our assumption, any hedging elements in the management of thermal production (6.9 TWh) and the procurement contract for nuclear power (9.1 TWh) should be included, we believe that the production volume of Axpo to be hedged is 22.1 TWh, which is made up of 3.4 TWh of flexible storage energy and 18.7 TWh of base load energy.

The hedging revenue (2.05 Rp./kWh, Table 2a) for flexible storage energy of 3.4 TWh on the basis of a 3-year rolling hedge with peak futures generates a 69.7 million share of EBIT.

The hedging revenue (1.72 Rp./kWh, Table 1a) for a base load of 18.7 TWh on the basis of a 3-year rolling hedge with base futures results in an EBIT share of 321.6 million.

Overall, we estimate Axpo’s positive net trading income from hedging at CHF 391.3 million.

**Axpo 2008/09: Contribution to EBIT from asset-backed trading in spot markets, incl. SDL (161 million)**

From asset-backed trading in (cross-border) spot trading (AbT spot, 4.74 Rp./kWh, Table 2a) we calculate an EBIT share of CHF 161.2 million for 3.4 TWh of flexible storage energy.

**Axpo 2008/09: Contribution to EBIT from asset-backed trading in forward markets (CHF 178 million)**

Asset-backed trading in forward markets (AbT future 1.11 Rp./kWh, Table 2a) yields an EBIT share of CHF 37.7 million for 3.4 TWh of flexible storage energy.

Asset-backed trading in forward markets (AbT future 0.75 Rp./kWh, Table 1a) yields an EBIT share of CHF 140.3 million for 18.7 TWh of base load energy.

Overall, asset-backed trading in forward markets generated a positive trading profit of CHF 178 million.
Plausibility check and reflection on Axpo’s 2008/09 annual results

We estimate an EBIT of CHF 887 million for the sale of the intrinsic value of Axpo power plants in 2009. Trading revenue for hedges related to our benchmark amounts to CHF + 391 million for a hedging production volume of 22.1 TWh. We estimate the trading revenue from asset-backed trading at CHF 339 million: In 2008/09, Axpo reported an approximate gross cash flow of CHF 22,000 million from traded energy derivatives. If we base the transaction costs on at least a single A rating of Axpo in 2009 of 20 bp, this would have resulted in transaction costs of CHF 44.0 million. Including these transaction costs, the hedging result would amount to CHF +370 million and the estimated positive earnings contribution from asset-backed trading to CHF +316 million.

At the EBIT level, Axpo is reporting an unclarified negative contribution to earnings of CHF 724 million. This is the difference between Axpo Holding’s annual result of CHF 849 million (=383+136+330 million) for the 2008/09 financial year and our estimated EBIT from power plant management, hedging and asset-backed trading of CHF 1,573 (=887+370+316) million.

In this section we document our understanding of the unresolved negative trading income of CHF 724 million at EBIT level.

i) The EBIT of Axpo AG (385 million) and CKW (136 million) is compared with our estimated intrinsic value for Axpo production and sales of 887 million. It is striking that our estimate exceeds the reported EBITs of Axpo AG and CKW by a total of 366 million. We therefore conclude that the 2008/09 annual result of the trading subsidiary EGL includes EUR 366 million as a share of the intrinsic value of Axpo’s power plants and procurement contracts. In terms of value, this corresponds roughly to thermal production and the procurement contracts for nuclear power.

ii) Without this share (CHF 366 million) in the intrinsic value of power plants and purchase contracts, EGL’s EBIT in 2008/09 would not have been CHF +330 million, but CHF -36 million. EGL’s trading income from hedging, asset-backed trading and prop trading would already have been offset in this partial result of EGL (CHF -36 million). We conclude from this that EGL’s energy trading activities, comprising hedging, asset-backed trading and prop trading, contributed a negative trading result of -36 million to Axpo Holding’s 2008/09 annual result. This negative contribution to earnings was financed by the intrinsic values of the power plants. From our point of view, this meant cross-financing of 20% within EGL to the detriment of the power plants.

iii) For a complete explanation, we would like to point out that EGL reported open energy transactions with third parties in the amount of slightly less than CHF 80,000 million for the 2008/09 financial year. This corresponds to approximately 32 times the market value of Axpo’s annual production in 2008/9 (excluding procurement contracts). It is not known how this contract volume is divided between hedging, asset-backed trading and prop trading.

iv) We derived the following statements about the performance of prop trading. To this end, it is helpful to estimate Axpo’s hedging volume and thus the success of hedges for the 2008/09 financial year.
v) In its Financial Report 2008/09 [4], Axpo shows the future success of its hedging strategy. We compare the item “Effect on income” on the balance sheet date for the four subsequent years (CHF 52.5, 26.7, 13.3, 5.5 million) and compare these with the four hedging successes (17.89, 9.01, 4.26, 3.26 CHF/MWh) resulting for the benchmark strategy in relation to the futures prices of the four subsequent years on the balance sheet date September 30. We can therefore see that, as at the balance sheet date of September 30, 2009, Axpo Holding had a hedge accounting volume of approx. 2.9 TWh for the first subsequent year 2009/10, approx. 3.0 TWh for the second subsequent year 2010/11, approx. 3.1 TWh for the third subsequent year 2011/12 and approx. 1.7 TWh for the fourth subsequent year 2012/13. This corresponds to about 3 TWh per subsequent year, rounded, and thus about 14% of the production volume of about 22 TWh to be hedged for the subsequent year (excluding thermal production and supply contracts).

vi) The energy derivatives include all trading transactions that cover short-term trading. Hedging positions may also be included, but are not shown separately as such. Looking at both assets and liabilities, it is noteworthy for Axpo in the 2008/09 financial year that energy derivatives on the assets side have a replacement value of +1,761 million energy derivatives on the liabilities side a replacement value of -1527 million. There is therefore a surplus of assets amounting to 234 million.

(vii) Energy derivatives can generally have highly non-linear payout structures, which is why the amount and sign of the overhang alone do not define how the trading subsidiary EGL will position itself vis-à-vis the market for the new financial year. If, however, it is assumed that the majority of energy derivatives are characterized by linear settlement structures, the replacement value of the hedging strategy rolling over three years can be used to determine the direction and hedging volume with which management and Group management would like to start the new financial year. The small share of options of approx. 1% of the contract volume [4] supports this assumption.

viii) If we consider Axpo’s surplus of assets in energy derivatives of +234 million and the replacement value of the hedging strategy as of September 30, 2009 of +18 CHF/MWh, we estimate that this would result in +13 TWh. This means that, in addition to hedge accounting, Axpo has hedged a long position (+) of 13 TWh across its whole energy derivatives portfolio. In practice, this means that as of the balance sheet date Axpo sold 13 TWh to the market by way of its energy derivatives position, which corresponds to approximately 50% of its total hedged production (approx. 22 TWh). Together with the aforementioned 3 TWh from hedge accounting, Axpo commercialized 16 TWh (i.e. approx. 75% of its hedging production in the following year 2009/10).

ix) If we assume continuity in hedging strategies, Axpo would have realized 75% of hedging gains, CHF 370 million, and thus approximately CHF 278 million, with an impact on income in the 2008/09 financial year. According to the Financial Report 2008/09 of Axpo Holding AG [4], however, a loss of CHF 42.3 million was reported in the income statement as part of hedge accounting for the 2008/09 financial year, instead of - as assumed above - CHF +278 million as hedging income. In our view, the loss realized on EGL’s prop trading was CHF 42.3 million more.

Summarizing our findings: With our understanding, EGL generated a positive earnings contribution of CHF 366 million in 2008/09 from the management of power plants, i.e. the intrinsic value of these power plants. EGL’s reported EBIT of CHF 330 million leads us to conclude that
EGL generated a negative earnings contribution totalling CHF -36(=330-366) million from hedging, asset-backed trading and prop trading.

Subsequently, we net EGL’s trading transactions from hedging, asset-backed trading and prop trading: for Axpo, we quantify the hedging success of our benchmark for rolling hedging over 3 years at CHF 391 million, which is based on a production volume of 22.1 TWh to be hedged at Axpo. We would have expected that a hedging success of CHF 391 million would have been transferred to the annual result. According to Axpo’s Financial Report 2008/09 [4], a loss of CHF 42.3 million was transferred. This leads us to conclude that Axpo speculatively refrained from hedging and at the same time declared counter items as hedging transactions which generated a loss of CHF 42 million, rounded, which explains the negative contribution to earnings of CHF 36 million. This would leave a netted positive profit contribution of CHF +6=-(36-(-42)). million, which was generated by asset traders and prop traders in total. If we now assume that 50% (CHF 158 million) of our estimated revenue potential (CHF 316 million) was realized with asset-backed trading, this would result in a loss of CHF 158-6=152 million for prop trading. If EGL’s asset traders had fully realized our estimated revenue potential of CHF 316 million, the prop traders’ loss would have been CHF 316-6=310 million. By definition, we consider income from trading transactions that deviate from, or overtax, specified hedging strategies to be prop trading. This means that the positive hedging result not generated (CHF +391 million) is also to be included as a negative trading result of CHF 391 million in EGL’s proprietary trading (prop trading).

In summation, we conclude that EGL’s prop trading may have generated an EBIT loss in the range of CHF 543-701 million at the level of EBIT in the financial year 2008/09. The lower value of this range results from a total of CHF 391+152 million, the upper value from a total of CHF 391+310 million. Relative to equity of CHF 7,595 million, the loss from proprietary trading amounts to approx. 8-9%.

As of September 30, 2009, EGL’s contract volume was slightly less than 80,000 million. Measured against an annual production market value of about 2,500 million in 2009, in other words, Axpo’s energy trading contract volume corresponds to 32 times its annual production.

Any positive earnings contributions from a sales portfolio managed by EGL would increase the loss in prop trading accordingly. This additional effect has not been included in our estimated range of 543-701 million, which we see as the loss from prop trading.

In the case of Axpo, there are therefore indications that Axpo - to put it very bluntly - made a bet at the time that electricity prices would not fall at the trading centers. In fact, measured against the benchmark of our 3-year rolling hedge as of September 30, 2009, base prices fell by CHF 17.2/MWh and peak prices by CHF 20.5/MWh. The term structure of the futures in the deep contango is likely to have led Axpo’s managers to build up speculative counter-positions, or at least allowed them.

Finally, we note that Axpo’s depreciation of CHF 232 million, or 38.1 TWh, corresponds to a production cost component of 0.61 Rp. per kWh. This is at least 0.59 Rp./kWh lower than we took for our EBIT-relevant production costs based on SFOE 2018 [2e]. This suggests that, at EBITDA level, EGL’s loss from prop trading might possibly be CHF 225 million more.
5.3 The 2009 BKW financial year (balance sheet date December 30, 2009)

In 2009 BKW reported its earnings from production and trading in the two business divisions Energy Switzerland and Energy International and Trading. According to the Financial Report 2009 [5], BKW produced 4.1 TWh from hydropower. Hydropower production is further divided into flexible storage energy (1.6 TWh) and run-of-river energy (2.5 TWh). BKW also produced 0.6 TWh of thermal energy. The nuclear power plants, including procurement contracts, contributed 5.8 TWh to BKW’s production volume. We divide this volume equally between nuclear production (Mühleberg power plant, 2.9 TWh) and procurement contracts for nuclear power (2.9 TWh). BKW produced and procured a total of 10.5 TWh in the 2008/09 financial year.

It is our understanding that BKW’s basic supply sales amount to approx. 8 TWh, which must be sold at 2 Rp./kWh below market price.

BKW 2009: EBIT contributions from production and sales (CHF 143 million)

The intrinsic value of run-of-river power (3.54 Rp./kWh) used to generate 2.5 TWh results in an EBIT share of 88.5 million

The intrinsic value for flexible storage energy (4.17 Rp./kWh) used to generate 1.6 TWh results in an EBIT share of 66.7 million

The intrinsic value for nuclear production (2.54 cp/kWh) used to generate 2.9 TWh results in an EBIT share of 73.7 million

The intrinsic value for the procurement of nuclear power (2.04 Rp./kWh) used to generate 2.9 TWh results in an EBIT share of 59.2 million

The intrinsic value for thermal production (2.54 Rp./kWh) used to generate 0.6 TWh results in an EBIT share of 15.2 million

BKW reports 8 TWh under Sales Switzerland, which we treat as a delivery to the basic supply. We are thus reducing BKW’s EBIT from production and sales by CHF 160 million because a delivery booked to bound end customers in 2009 will be reimbursed at around 2 Rp./kWh less than the market rate.

In summation, we estimate BKW’s EBIT from production and sales to be approximately CHF 143.3 million.

BKW 2009: EBIT contribution from hedging (CHF 85.8 million)

In 2009, BKW reported a total production (including procurement contracts) of 10.5 TWh. After deducting the 8 TWh share of the basic supply, 2.5 TWh are left as the quantity to be hedged, which is made up of 1.6 TWh of flexible storage production and 0.9 TWh of run-of-river production.

The hedging revenue (3.55 Rp./kWh, Table 2b) for flexible storage energy 1.6 TWh on the basis of a rolling hedge with peak futures over three years results in an EBIT share of CHF 56.8 million.
The hedging revenue (3.22 Rp./kWh, Table 1b) for base load electricity on the basis of a rolling hedge with base futures over three years results in an EBIT share of CHF 29.0 million for 0.9 TWh.

**BKW 2009: EBIT contribution from asset-backed trading in spot markets (CHF 72.3 million)**

The asset-backed trading in (cross-border) spot trading (AbT spot 4.52 Rp./kWh, Table 2b) provides an EBIT share of 72.3 million euros for 1.6 TWh of flexible storage energy.

**BKW 2009: EBIT contribution from asset-backed trading in forward markets (CHF 24.1 million)**

Asset-backed trading in forward markets is limited to the production volume of 2.5 TWh to be hedged, which consists of 1.6 TWh of flexible storage energy and 0.9 TWh of run-of-river energy.

From asset-backed trading in forward markets (AbT future 1.08 Rp./kWh, Table 2b), we generate an EBIT share of 17.3 million for 1.6 TWh of flexible storage energy. Asset backed trading in forward markets (AbT future 0.75 Rp/kWh, Table 1b) yields an EBIT share of CHF 6.8 million for 0.9 TWh of base load energy.

**Validation and reflection of BKW’s 2009 annual results**

Excluding transaction costs, we estimate the positive earnings contribution from production and sales (CHF 143.3 million), hedging (CHF 85.8 million) and asset-backed trading (CHF 96.4 million) to be approximately CHF 325 million. In 2009, BKW reported a gross cash flow of approximately CHF 3,500 million from traded energy derivatives. If we assume at least a single A rating for BKW in 2009 and thus base transaction costs on 20 bp, transaction costs would amount to CHF 7.0 million. This would give us an estimated EBIT of CHF 318 million for BKW’s two business divisions in 2009, consisting of a positive trading profit from production and sales of CHF 140 million, a positive hedging profit (CHF 84 million) and an estimated positive earnings contribution from asset-backed trading (CHF 94 million).

If we compare our estimate of the intrinsic value of the power plants and procurement contracts of CHF 140 million with the EBIT of CHF 74.2 million reported by BKW for the Energy Switzerland business area, we can see that the Energy International and Trading business area accounted for approximately CHF 66 million in 2009. In terms of value, this corresponds roughly to thermal production and the procurement of nuclear power.

In its 2009 Financial Report BKW does not report any hedge accounting for energy hedging. As a reminder, hedging transactions do not necessarily have to flow into hedge accounting. Nor does segment reporting necessarily have to reflect the actual hedging result. Hedging gains can a) be realized before the balance sheet date, for example if the hedging instrument is settled, or b) recognized in the replacement values of the energy derivatives.

The energy derivatives include all trading transactions that cover short-term trading. Hedging positions may also be included, but are not shown separately as such. Looking at the balance sheet positions, both assets and liabilities, it is noticeable at BKW in the 2009 financial year that
energy derivatives have a replacement value of +125 million on the assets side, while energy
derivatives have a replacement value of -130 million on the liabilities side. There is therefore a
surplus of -5 million on the liabilities side, which indicates that there are open positions of this
amount.

Energy derivatives can generally have strongly non-linear payout structures, which is why the
amount and sign of the surplus alone do not define how the trading unit will present itself to
the markets for the new financial year. The contract volume does not include any options,
which means that the payout structures in BKW’s energy derivatives are linear. The
replacement value of the 3-year rolling hedging strategy indicates the direction and volume of
hedging that both management and Group management plan to take in the new financial year.

Let us now take for BKW the surplus of liabilities in energy derivatives of CHF -5 million and
the replacement value of the hedging strategy of CHF +18/MWh based on the front futures for
delivery in 2010 (as of December 31, 2009). The rounded figure is minus 0.278 TWh. This shows
that BKW hedged a short position of 0.278 TWh using its energy derivatives portfolio. In practice,
this means that by the balance sheet date, in terms of value, BKW had purchased 0.278 TWh
more from the market than its sales volume for subsequent years reported.

Including transaction costs, we estimate the EBIT potential for BKW’s two divisions at CHF
318 (=140+84+94) million. BKW’s combined EBIT for the two divisions is approximately CHF
234 million. The unexplained share of a negative earnings contribution at EBIT level is +84 million,
which is smaller than our estimated positive earnings contribution from asset-backed trading of
CHF 94 million. At the level of EBIT, we therefore see the hedging success based on our
benchmark of CHF 86 million realized in BKW’s annual result. This is not part of hedge
accounting but part of energy trading. This means that the hedging gain generated in 2009 is
implicitly reported as BKW’s trading profit. With this in mind, we would like to point out that
in our opinion hedging success is de facto determined by the development of electricity prices
and should be reported separately from trading success.

If the asset traders realized 50% (CHF 47 million) of our estimated EBIT potential (CHF 94
million), this would result in a negative trading result of CHF 37 million for BKW’s prop trading.
If the asset traders were to realize the estimated CHF 94 million in full, this would result in a
prop trading loss of CHF 84 million.

In summation, we conclude that BKW’s prop trading generated an EBIT loss between CHF 37
and CHF 84 million in 2009. This is less than our estimate of the EBIT potential for asset-backed
trading (CHF 94 million). From our point of view, this shows that the hedging gains were
realized consistently with market movements. Due to the lack of hedge accounting, this is
indirectly reported as a trading gain in energy trading. Any positive earnings contributions
resulting from a sales portfolio managed by BKW that goes beyond the base supply would
increase the loss in prop trading. This additional effect has not been included in our estimated
range of 37-84 million, which we see as the loss from BKW’s prop trading. Compared to CHF
3,244 million in equity, the loss from proprietary trading was approx. 1-3%.

BKW’s contract volume as of the balance sheet date of December 31, 2009 amounted to
approximately CHF 2,000 million. Compared with a market value of annual production of
approx. 750 million in 2009, the contract volume of BKW’s energy trading is equivalent to four times its annual production.

Taking depreciation into account, we came to the following final conclusion for BKW: BKW’s depreciation of CHF 61.3 million, based on a production volume of 10.5 TWh (incl. procurement contracts), correspond to a production cost component of 0.58 Rp./kWh. This is at least 0.62 Rp./kWh lower than we assumed on the basis of SFOE 2018 [2e] for our EBIT-relevant production costs. This leads us to conclude that at the EBITDA level, the negative earnings contribution from prop trading could be about CHF 65 million more.

6. Conclusion

We calculated the revenue potential of asset-backed trading on the basis of models and assumptions whose robustness was documented in the previous sections. Together with the remarks on financial reporting, they demonstrate the need for greater transparency with regard to hedging transactions, asset-backed trading and prop trading. Otherwise, there is a possibility that the performance risks of prop trading will overlap with the hedging or revenue potential of asset-backed trading. The differentiated performance and risk assessment of the aforementioned corporate activities, in particular with regard to risk and speculative transactions, is part of good corporate governance.

It should be noted that IFRS accounting is a general accounting system based on principles and does not regulate all, in particular industry-specific accounting issues in detail. However, this must not impede the provision of information useful for decision-making in reporting. In the interests of good corporate governance, the Board of Directors and stakeholders must be informed in a differentiated manner about the performance and risks of the individual business models in electricity trading and hedging transactions in order be able to act.

In detail, this means, for example, that explanations are required as to why energy derivatives were entered into, including disclosure of the respective performance, volumes and risks. Especially because energy derivatives can regularly be assigned to prop trading, asset-backed trading and hedging. This can be done separately in the notes to the financial statements, but also via an allocation in segment reporting.

Furthermore, surpluses of active or passive energy derivatives must be explained. Open positions should be reported and explained in detail with regard to their risks. Significant nonlinear relationships between energy derivatives of both assets and liabilities should also be explained in the annual or financial report with respect to their origins.

It is known that the tracking and unambiguous allocation of hedging activities poses considerable challenges for IFRS reporting in terms of adequately mapping risk positions from the perspective of risk management. In the future the elimination of accounting mismatches will also not be fully possible. However, this should not prevent management from explaining significant differences between accounting and risk management. For example, it should be explained which hedging strategy the company follows and to what extent hedging relationships were subsequently modified or discarded by the company and what effect their adjustments had on earnings.
The timing and direction of the hedging as well as the hedging volume define the success of a hedging strategy. As a warning, we note that prop trading within energy trading, in addition to the potential of speculative losses, can also override the hedges implemented and thus destroy a large part of the hedging success. On the basis of the reports [3,4,5] from Alpiq, Axpo and BKW, it is apparent that hedge accounting was not applied or applied to a very limited extent in the 2009 and 2008/09 financial years. Our understanding of speculative trading (proprietary trading, prop trading) begins when hedging corridors are exceeded. On the basis of this criterion and our breakdown of EBIT by the intrinsic value of the power plants (incl. procurement contracts), hedging transactions, asset-backed trading and prop trading, we find that speculative trading with a negative contribution to earnings weakened the 2009 and 2008/09 annual results respectively. For Alpiq and Axpo, we estimate this negative earnings contribution from prop trading to be in the mid three-digit million range. In our view, Alpiq’s proprietary trading losses are cross-financed by asset-backed trading, while Axpo’s losses are additionally financed by an approx. 20% share of EBIT resulting from EGL’s management of power plants. In the case of BKW, our estimated hedging success was not realized through hedge accounting but indirectly through trading transactions within energy trading. Furthermore, the loss limits set for prop trading are likely to be lower than our estimated EBIT potential for asset-backed trading. For BKW we estimate a negative earnings contribution from proprietary trading (prop trading) in a range of 37-84 million, which in our view reduces the (positive) earnings contribution of BKW’s asset traders.

Based on our assumptions and analyses, we analyzed the earnings contribution of prop trading as part of energy trading within the three major Swiss electricity producers for the 2008/09 and 2009 financial years and separated it from asset-backed trading. The analysis includes the intrinsic value of the power plant parks and hedging transactions both in hedge accounting and energy trading. How the earnings contribution from proprietary trading for the three major Swiss electricity producers developed under our models in the subsequent financial years 2010-2018 is the subject of forthcoming studies.
7. References

References (additional)


Press and media coverage


