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Performance Issues in Swiss Electricity Trading

(The commencement of limited liberalization in Switzerland)

A Position Paper on the Swiss Electricity Industry

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Management Summary

The necessity of *proprietary trading (prop trading)* as a core component of the Swiss electricity companies' business model is politically controversial. We define *prop trading* as *speculative trading* without reference to the use of certain resources (for example, power plants, transmission capacities, or storage). At the same time, this represents the difference to *asset-backed trading*. In order to best identify any cross-financing of negative earnings contributions from *prop trading* in the financial and annual reports, we include *hedging transactions* and the *intrinsic value* of the power plants. The *intrinsic value* of a power plant is the revenue from electricity production on the basis of *Swissix* (market area Switzerland) less *EBIT-relevant production costs*. Within documented model assumptions, we estimate the *EBIT potential* for the *intrinsic value of the power plants* and for *asset-backed trading in spot and forward markets*. In order to quantify the *hedging success*, we define a rolling hedging strategy for peak and base energy over 3 years on the basis of *peak* and *base futures*, which serves as our benchmark.

For the 2008/09 and 2009 financial years, we have analyzed the contribution to earnings made by *prop trading* by the major Swiss electricity producers *Alpiq, Axpo and BKW*. We based our analysis on the relevant financial and annual reports for the underlying financial year, on our assumptions and the resulting estimates for the various EBIT contributions.

Our calculations for potential return for *asset-backed trading* are based on models and assumptions whose robustness is documented. Together with the narrative on financial reporting, they demonstrate the need for greater transparency with regard to *hedging transactions*, *asset-backed* and *proprietary trading*. There is otherwise a potential overlap **of** the performance risks of *prop trading* and the *hedging* or revenue potential of *asset-backed trading*. The differentiated performance and risk assessment of the corporate activities addressed, 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. However, IFRS priniciples should not limit the provision of valuable reporting information for decision-making. In the interests of *good corporate governance*, the board of directors and management should have diffentiated, substantial information about the performance and risks of the individual business models in electricity trading and about hedging transactions, in order to react accordingly.

The *timing and direction of hedging* as well as the *hedging volume* define the success of a hedging strategy. We would like to point out that *prop trading* within energy trading, in addition to potential speculative losses, can also override the hedges implemented and thus negate a large part of the hedging success.

Based on the reports of *Alpiq*, *Axpo* and *BKW*, we found that *hedge accounting* was rarely or only to a very limited extent exercised in the financial years 2009 and 2008/09. According to our interpretation, *speculative trading* (*proprietary trading, prop trading*) begins as soon as the specified hedging corridors are exceeded. Based on this criterion and our breakdown of EBIT into the *intrinsic value of the power plants* (*including purchasing contracts*), *hedging transactions*, *asset-backed trading* and *proprietary trading* (prop trading), we find that speculative trading with a *negative contribution to earnings* significantly worsened the 2009 and 2008/09 annual results.

For *Alpiq* and *Axpo*, we estimate this negative earnings contribution from *prop trading* to be in the mid three-digit million range. We believe that *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 the EBIT resulting from *EGL's* power plant operations. In the case of *BKW*, we see that our estimated hedging success was not realized using *hedge accounting* but indirectly with transactions within the energy trading business. For *BKW* we estimate that *prop trading* will have a negative contribution to earnings in the mid double-digit million range.

Based on our assumptions and assessments, we have analyzed the *earnings contribution of prop trading* as part of energy trading within the three major Swiss electricity producers for the financial years 2008/09 and 2009 and have distinguished it from *asset-backed trading*. The analysis includes the *intrinsic value of the power plants* and *hedging transactions* both in *hedge accounting* and energy trading. The contribution to earnings from *proprietary trading* for the three major Swiss electricity producers in the subsequent financial years 2010-2018 derived from our model structures is the subject of forthcoming studies.

In summation, we draw the following conclusions from *Alpiq*, *Axpo* and *BKW's* 2008/09 and 2009 annual results based on the documented model assumptions:

Alpiq: 2009 Annual Results [3]

Alpiq produced and procured 34.8 TWh of electricity. In its Financial Report 2009, *Alpiq* reports EBIT of CHF 127 million for its *Trading & Services* division. Our benchmark for hedging applied to an *Alpiq* production volume (*long* position) to be hedged of 12.8 TWh results in a hedging gain of CHF 420 million as of December 31, 2009. In the 2009 Financial Report, *Alpiq* reports a hedging loss of CHF 22 million. Relative to our benchmark, this corresponds to a hedging of a *short* position (as to part of a delivery obligation) of 0.6 TWh. This represents a 0.6 TWh overcoverage of a delivery obligation, which had to be sold back to the market at lower prices..

For *asset-backed trading in spot and forward markets*, we estimate *Alpiq's* EBIT potential at CHF 217 million. Together with the unreported hedging result of CHF 420 million, this results in a *negative contribution to earnings from proprietary trading* of CHF 510 million. If the *asset traders* had generated 50% (CHF 108 million) of our estimated EBIT potential from *asset-backed trading*, a *loss from proprietary trading* of CHF 402 million would have been realized. Depending on the trading performance of the asset traders, we thus estimate the *loss from proprietary trading of Alpiq* at CHF 402-510 million. Relative to the *equity* of CHF 7,930 million, the loss from proprietary trading amounts to approx. 6%.

Alpiq's contract volume as of December 31, 2009 was approximately 55,000 million. Measured against the market value of its annual production of rounded 1,500 million in 2009, the contract volume of *Alpiq's* energy trading corresponds to 36 times its annual production.

Axpo: 2008/09 Annual Results [4]

Axpo produced and procured 38.1 TWh of electricity. We compare the EBIT of the subsidiaries *Axpo AG* (385 million) and *CKW* (136 million) with our estimated *intrinsic value* of 887 million for *Axpo's* production and sales. It is obvious that our estimate exceeds the reported EBITs of *Axpo AG* and *CKW* by a total of 366 million. We therefore conclude that in the 2008/09 annual

result the trading subsidiary *EGL* was allocated 366 million as a proportion of the *intrinsic value* of *Axpo's* power plants, including *procurement contracts*. This is due to *EGL's* contribution to the management of its power plants. We therefore come to the conclusion that *EGL* generated a combined negative contribution to earnings of CHF 36 million from *hedging*, *asset-backed trading* and *prop trading*. In our view, this negative contribution to earnings was cross-financed by EBIT contributions from the power plants, amounting to 20% of EGL's share.

Our benchmark for hedging applied to an *Axpo* production volume (*long* position) of 22.1 TWh to be hedged results in a hedging gain of CHF 370 million as of September 30, 2009. For the year under review, *Alpiq* recorded a loss of CHF 42.3 million in *hedge accounting* in the Income Statement.

For *asset-backed trading in spot and forward markets*, we estimate *Axpo's* EBIT potential at CHF 316 million. Together with the unreported hedging result of CHF 370 million, this adds up to a *negative contribution from proprietary trading* of CHF 701 million. If *Axpo's asset traders* had generated 50% (CHF 158 million) of our estimated EBIT potential in *asset-backed trading*, a loss from *proprietary trading* of CHF 543 million would have been realized. Depending on the trading success of *Axpo's* asset traders, we thus estimate the *loss from proprietary trading* at CHF 543-701 million. Relative to an *equity capital* of CHF 7,595 million, the loss from *proprietary trading* was approx. 8-9%.

Axpo's contract volume on the balance sheet as of September 30, 2009 was slightly less than 80,000 million. Measured against a market value of approximately 2,500 million in 2009 means that *Axpo's* energy trading contract volume was equal to 32 times its annual production.

BKW: 2008/09 Annual Results [5]

BKW produced a total of 10.5 TWh in 2009 and generated EBIT of CHF 234 million with its *Energy Switzerland and Energy International and Trading* business areas. We estimate an EBIT of CHF 140 million for *production and sales*. In our opinion, a production volume (*long* position) of 2.5 TWh should be, less the base supply of 8 TWh, hedged. Based on our hedging benchmark, we posted a positive hedging result of CHF 84 million as of the balance sheet date. At *EBIT* level, we therefore see the hedging result realized in *BKW's* annual result, not as part of *hedge accounting*, but as part of energy trading. In our view, this means that the hedging gain resulting in 2009 is implicitly reported as *BKW's* trading profit.

We estimate *BKW's* EBIT potential for *asset-backed trading in spot and forward markets* at CHF 94 million. If the *asset traders* had realized the estimated CHF 94 million in full, this would result in a *prop trading loss* of CHF 84 million. If the *asset traders* had realized 50% (CHF 47 million), this would have resulted in a *negative trading result* of CHF 37 million for *BKW's prop trading*. We therefore estimate the *loss in BKW's proprietary trading* at CHF 37-84 million. Relative to an *equity capital* of CHF 3,244 million, the *loss from proprietary trading* was approx. 1-3%.

BKW's contract volume as of December 31, 2009 was approximately CHF 2,000 million. Measured against a market value of about CHF 750 million for annual production in 2009 means that *BKW's* energy trading contract volume was approximately 2.7 times its annual production.

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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 are 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: The ior/cf-HSG: 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.

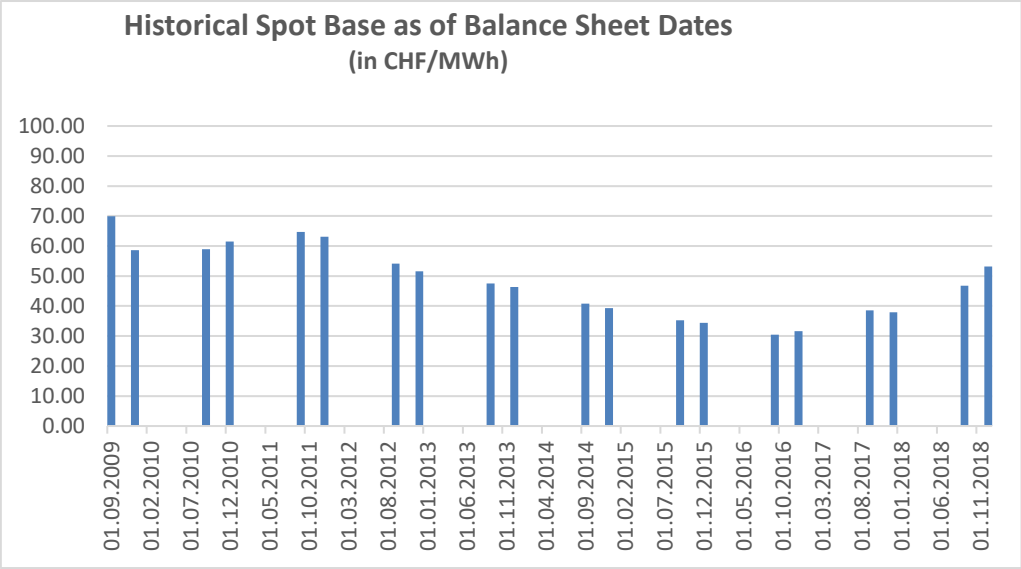


Figure 1a: Average spot base prices (Phelix) for different fiscal years and balance sheet dates (CHF/MWh).

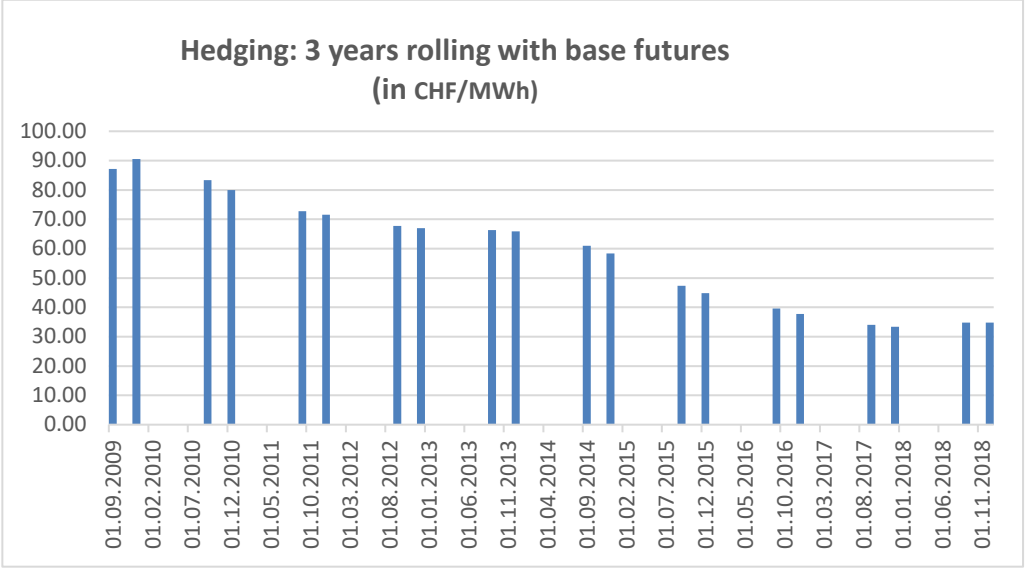


Figure 1b: Market value development (CHF/MWh) of a rolling hedging strategy with base futures (Phelix) for the financial year and balance sheet date (2009-2018).

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.

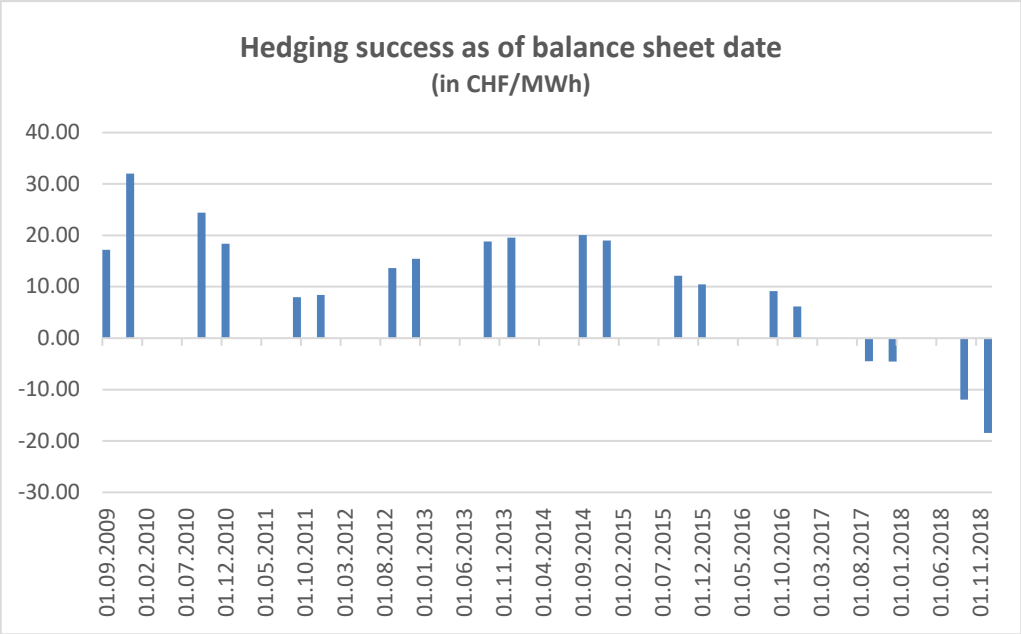


Figure 1c: Development of hedging success (CHF/MWh) of a rolling hedging strategy compared to spot base (based on financial year and balance sheet date)

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.

Run-of-river power plants (Balance Sheet as of 30.09.)										
Rp./kWh	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18
Base D-A	7.27	6.74	6.84	5.91	5.16	4.47	4.01	3.58	4.53	5.98
Hedge Base	1.72	2.44	0.80	1.36	1.88	2.01	1.22	0.92	-0.45	-1.20
AbT-Future	0.75	0.75	1.05	0.85	0.53	0.39	0.37	0.39	0.43	0.57
Total Revenue	**9.87**	**9.94**	**8.69**	**8.11**	**7.59**	**6.86**	**5.57**	**4.87**	**4.31**	**5.41**

Table 1a: Historical revenue (Rp./kWh) for run-of-river power plants as of balance sheet date September 30 / Calculations by ior/cf-HSG based on EEX, Epex-Spot; excluding trading with guarantees of origin.

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).

Run-of-river power plants (Balance Sheet as of December 31.12.)										
Rp./kWh	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Base D-A	7.54	6.45	6.40	5.97	5.21	4.53	4.11	4.24	5.04	6.00
Hedge Base	3.22	1.90	0.85	1.54	1.95	1.94	1.06	0.61	-0.45	-1.83
AbT-Future	0.75	0.83	1.00	0.77	0.49	0.38	0.37	0.40	0.46	0.58
Total Revenue	**11.51**	**9.17**	**8.25**	**8.28**	**7.65**	**6.85**	**5.54**	**5.26**	**5.05**	**4.75**

Table 1b: Historical revenues (Rp./kWh) for run-of-river power plants as of balance sheet date December 31 / Calculations by ior/cf-HSG based on EEX, Epex-Spot; excluding trading with guarantees of origin.

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.

Storage Power Plants (Balance Sheet as of September 30)										
Rp./kWh	**08/09**	**09/10**	**10/11**	**11/12**	**12/13**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**
Peak D-A	10.73	8.79	8.28	7.82	6.92	5.90	5.19	4.69	6.04	7.31
Hedge Peak	2.05	3.18	1.95	2.03	1.90	1.93	1.43	1.08	-0.29	-1.14
AbT-Spot	4.74	3.87	4.19	2.89	3.10	2.40	1.95	1.99	2.15	2.39
AbT-Future	1.11	0.98	1.27	1.13	0.71	0.51	0.47	0.51	0.57	0.69
Total Revenue	**18.75**	**16.84**	**15.69**	**13.86**	**12.65**	**10.74**	**9.03**	**8.26**	**8.26**	**9.32**

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.

Storage Power Plants (Balance Sheet as of 31.12.)										
Rp./kWh	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Peak D-A	9.67	7.90	7.55	7.61	6.92	5.74	5.14	5.23	6.17	7.27
Hedge Peak	3.55	2.63	2.00	2.22	1.97	1.86	1.27	0.78	-0.29	-1.77
AbT-Spot	4.52	3.95	3.87	2.94	2.92	2.29	1.96	2.03	2.21	2.54
AbT-Future	1.08	1.05	1.23	1.02	0.66	0.50	0.48	0.53	0.60	0.72
Total Revenue	**18.82**	**15.54**	**14.66**	**13.79**	**12.47**	**10.39**	**8.86**	**8.56**	**8.69**	**8.75**

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).

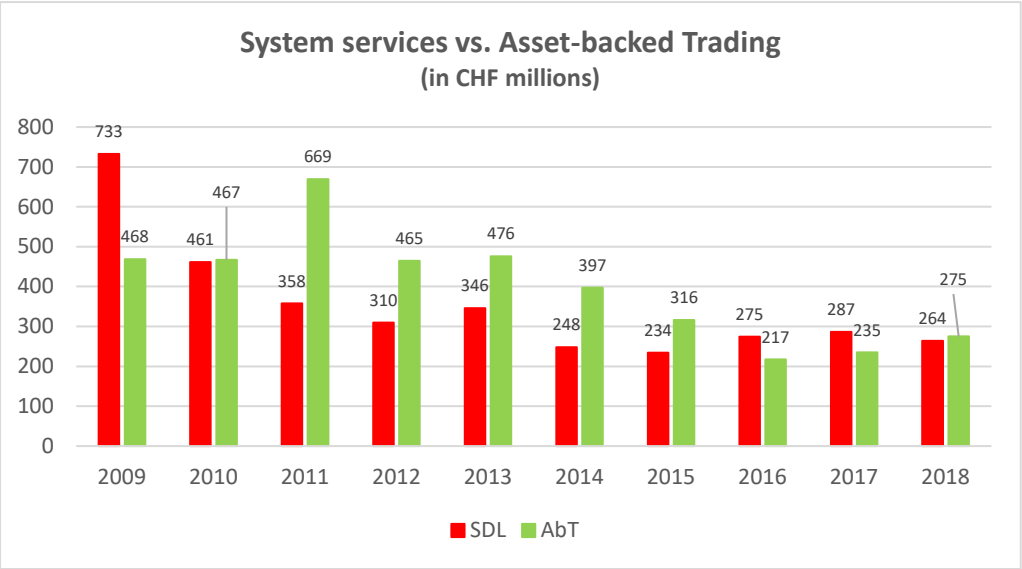


Figure 2a: System services vs. asset-backed trading (in CHF millions) in the spot market. Data sources: Swissgrid, EEX, BFE, WASTA / ior/cf-HSG calculations.

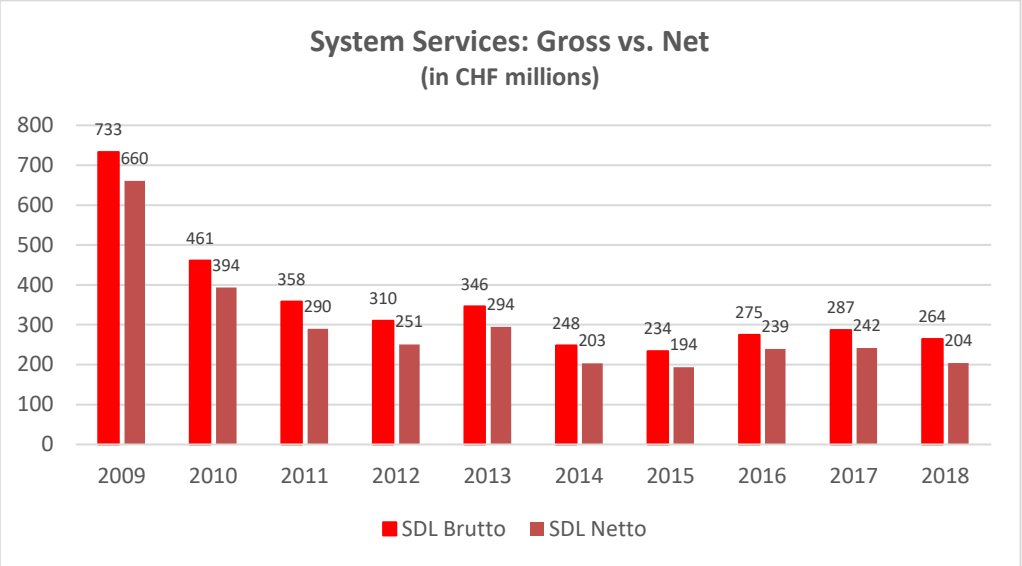


Figure 2b: System services: gross vs. net (in CHF million), data source: Swissgrid, EEX, BFE, WASTA / calculations by ior/cf-HSG.

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 2009-20018 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 turbined 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.

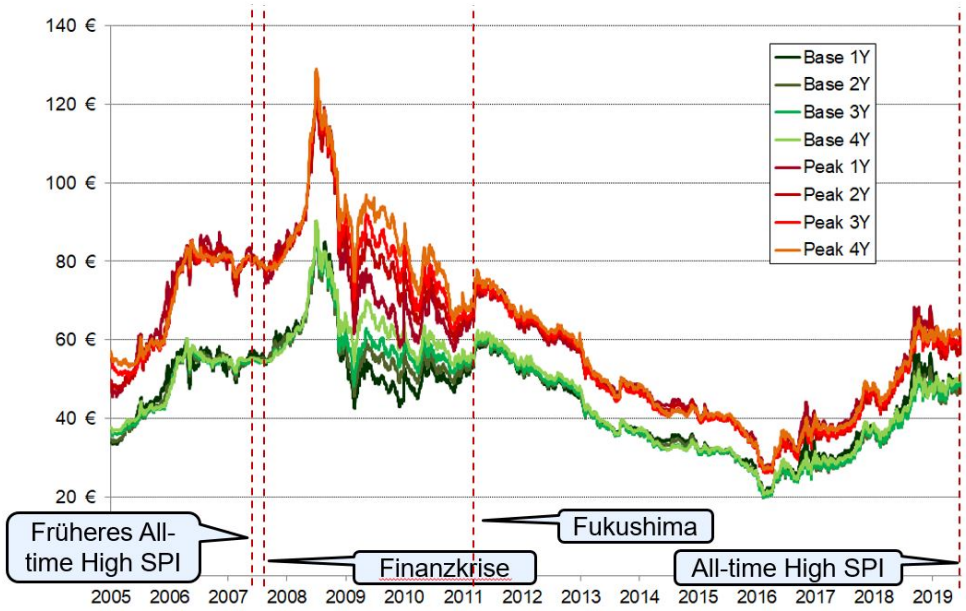


Figure 3: Development of futures prices on the EEX for 4 front years (Q1 05 - Q2 19).

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

[8], 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./kWh and, analogous to Table 2a, an *intrinsic value* of 5.23 Rp./kWh 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 quantify the *intrinsic value* (2.27 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.

The *intrinsic value* for *thermal production* (2.54 Rp./kWh) applied to 6.5 TWh results in an *EBIT share* of 165.1 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 ofroughly 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 value*s 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 is 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.

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