Detailed Level Design of the

Forward Market in Greece

Task 1.1, version 4.0

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Executive Summary

ECCO International has been commissioned by the Joint Research Centre of the European Commission to develop a Detailed Level Design for the Market Design of the Forward, Day-Ahead, and Intraday Markets in Greece, as well as the respective Market Codes. This report is the **deliverable of Task 1.1 of this project**. The report analyzes the formation of the **Greek Forward Electricity Market and presents a Detailed Level Design of this market**, taking into consideration the special characteristics of the Greek electricity market.

A growing number of European Union countries have recently restructured their electric power sectors to introduce competition, improve services to consumers and deal with the environmental challenges of our times. Although the speed and scope of the reforms vary across countries, such liberalization processes have been based on opening the electricity systems to competition wherever it was considered to be feasible, notably in the generation and retail activities. The deregulating processes have been accompanied by the introduction of competitive spot wholesale and retail electricity markets, and Forward Contracts on electricity, both Over-the-Counter (OTC) and centrally-traded (Exchange-Based Forward Markets), providing a variety of contract provisions to meet the needs of the electricity Participants.

Specifically, for the Greek electricity Spot Market, it is common knowledge that in its current format is seriously flawed. Clearly it cannot fulfill the expectations of an open competitive market. Specifically, vulnerability to fuel price volatility and amenability to market power abuse has dominated the market. These risks have created an **acute need for financial hedging among Participants**, which can be accomplished with the implementation of an efficient medium/long-term pricing mechanism that will sustain and secure the stability of the market in a significant way.

Based on our international experience, we believe that the optimal set-up for the Greek electricity market consists of the Spot (Day-Ahead Market and Intra-Day Market) and Balancing Markets, complemented with the medium/long-term Forward Market, described in this report. This Forward Market will partially disengage Participants from the Spot Market price (Day-Ahead Market Clearing Price), allowing them to form prices according to their own estimations.

It should be mentioned that most countries that entered liberalization with a mandatory Power Pool system like Greece, moved on to adopt a semi-compulsory Power Pool, combined with a Forward Market. Similar market structures have been designed and implemented all around the world. For example, we can mention the England & Wales liberalized market, which commenced as a mandatory Power Pool and the California electricity market (another mandatory Power Pool), which collapsed during the California energy crisis under very scarce supply conditions.



For the drafting of this report, an extensive research and analysis of the Central Western European (CWE), Nordic and Italic Forward and Futures Markets has been carried out. This research revealed that both markets (i.e. Forward and Futures Markets) have been addressed in many European countries. The essential structure and scope of implementation of the Forward and Futures Markets is the same, making both mechanisms relevant to the analysis presented in this report. The basic difference

between them concerns the obligation of Physical Delivery of the electricity underlying each contract. Specifically, Forward Contracts, as the ones described in this report, are accompanied with the obligation of injection/withdrawal of the electricity underlying the relevant forward position into/from the Transmission System, while Futures Contracts provide the option to

Based on the Greek Law 4425/2016, the tradable products in the Forward Market shall be Forward Contracts with obligation of Physical Delivery.

perform Physical Delivery of the electricity underlying the relevant futures position. In most cases, Futures Contracts do not lead to Physical Delivery.

It should be noted that this report analyzes the design architecture of the internal Forward Electricity Market in Greece. Current cross-border forward arrangements for the capacity allocation in the interconnections with Greece' neighbouring TSOs (explicit yearly and monthly auctions for the purchase of PTRs) are in line with the ACER Framework Guidelines and ENTSO's corresponding Network Code, thus, they shall be retained at their current state.

In summary, the overall **benefits of the Greek Forward Market** are:

- Forward Contracts shall address the price risk by enabling Participants to lock in prices and quantities, thus limiting their exposure to the more volatile Spot Market.
- A Forward Market shall deter market power abuse by providing a substitutional choice of forward contracting, when the Day-Ahead Market Clearing Price is susceptible to strategic behavior; thus, prices shall stabilize and evolve over time with reduced market distortions.
- Forward contracting shall enhance the Greek market's compatibility with longerrange activities, such as system planning for generation, transmission, distribution and demand response investments, by indicating long-term future expectations of market prices.

The structure of this report is the following:

Chapter 1 introduces the basic benefits of the implementation of a Forward Market in Greece.



Chapter 2 presents the fundamentals of trading in Forward Markets and provides essential information on the forward instruments that are commonly used in electricity markets. Common traded forward Products are analyzed, along with detailed product specifications. Furthermore, *Chapter 2* presents tangible examples of how Forward Contracts can be used to reduce the price risks, within the framework of competitive electricity markets.

Chapter 3 defines the Entities and the Participants which are allowed to participate in the Forward Market. It also defines the concept of registry that the Market Operator, the Transmission System Operator and the RES and CHP Units Registry Operator required to maintain.

Chapter 4 presents the detailed market architecture of the Greek Exchange-Based Forward Market, namely the trading procedures and timings, the Orders that can be submitted in the Trading Platform of the Market Operator as well as the execution and time specifications. Finally, this Chapter elaborates on the Forward Contracts available for trading in this market.

Chapter 5 presents the market rules of the Bilateral OTC Market. The Bilateral OTC Contracts traded outside the Exchange-Based Forward Market are presented. Furthermore, this Chapter emphasizes on the way the Bilateral OTC Contracts and settled and registered in the Nomination Platform of the Market Operator.

Chapter 6 presents the registration process within the frame of the Physical Settlement of the Forward Contracts traded both in the Exchange-Based Forward Market and the Bilateral OTC Market.

Chapter 7 presents the Physical Delivery/Offtake Nomination process carried out by the Participant within the frame of the Physical Settlement of the Forward Contracts.

Chapter 8 presents the Financial Settlement carried out by the Clearing House both of the Exchange-Based Forward Contracts and the respective Bilateral OTC Contracts.

Chapter 9 presents the interface between the trading processes, the Clearing and Settlement processes including the main tasks performed by the Clearing House, the interface between the Market Operator and the Clearing House at the Trading Period and the interface between the Market Operator and the Clearing House during the registration process.

Chapter 10 presents the market rules related to the maximum percentage of forward contracted quantities to cover a demand portfolio that is imposed to Load Representatives with significant retail market shares. This provision is crucial in order to secure the smooth transition of the current market structure to a market where more Participants are vertically-integrated and participate with significant portfolios in the wholesale and retail market in Greece.



1 Introduction

1.1 Electricity, the Commodity

Electricity may be considered as a flow commodity strongly characterized by its very limited storability and transportability. Both limitations of "carrying" electricity across time and space are crucial in explaining the behavior of electricity Spot and Forward Markets and prices as compared to those of other commodities. In other words, arbitrage in electricity markets across time and space, which is based on storability and transportation, is seriously limited. Provided that arbitrage is limited, spot prices are highly dependent on temporal and local supply and demand conditions.

The non-storability of electricity at the present time makes electricity delivered at different times and on different dates to be perceived by users as distinct commodities. In other words, prices are strongly dependent on the electricity needs (demand) and their determinants at every precise moment (this is to say, business activity, temporal weather conditions, etc.). Distinguishing between on-peak and off-peak electricity prices (prices during peak and off-peak demand periods), or among prices corresponding to different Delivery Periods, such as months or quarters, is indeed important in electricity markets (such distinctions determine, for instance, forward contractual terms).

Transportation constraints for electricity, on the other hand, come in the form of capacity limits in the transmission lines and transmission losses, which can make impossible or uneconomical the transmission of electricity among certain regions. These limitations make electricity contracts and prices highly local, i.e. strongly dependent on the local determinants of supply and demand (such as characteristics of the local generation plants, and local climate and weather conditions together with their derived uses of electricity).

1.2 Using Forward Markets to Improve Electricity Market Design

Electricity market design seeks to develop efficient market mechanisms to optimally provide products and services and satisfy consumers' demand for electricity at minimum cost. This requires both short-run efficiency (the operation of existing resources at minimum cost) and long-run efficiency (investment in the right quantity and mix of resources at the right place). Both goals are made difficult by the specific characteristics of the electricity: supply and demand must be balanced at every instant and at every location; the physical constraints of the network must be respected; demand is often unresponsive to spot price fluctuations - consumers have no ability to express preferences for reliability.

The goals of electricity market design are better met when the Spot Market is complemented with a Forward Market. A well-designed Spot Market is necessary for



efficient market outcomes, but is not sufficient. Efficiency requires that issues of risk, market power, and investment be addressed:

- The Forward Markets address the price risk by enabling the Participants to lock in prices and quantities, limiting exposure to the more volatile Spot Market.
- Market power is addressed by putting Participants in a more balanced position entering the Spot Market, mitigating the incentive to distort Orders.
- Finally, the long-term market coordinates investment in new resources, assuring that adequate resources will be available when and where they are most needed.

The **California electricity crisis of 2000 - 2001** illustrated all too well the problems that can arise when one relies excessively on the Spot Market. Key conditions of the crisis were insufficient forward contracting and tight supply. During this prolonged period of tight supply, the un-hedged demanders were exposed to unsustainable high spot prices. Suppliers, also positioned without Forward Contracts, had strong incentives to exercise market power further exacerbating high prices and inefficient market outcomes. The load representatives, despite initially being well capitalized, ultimately teetered toward bankruptcy and the market collapsed. Indeed, the strongest Investor Owned Utility in California, Pacific Gas and Electric Company, went into bankruptcy in 2001.

The Forward Market under development would have reduced or perhaps prevented the crisis:

- To the extent that the crisis was caused by inadequate resources, the long-term market would have ensured over time sufficient investment to relieve the tight supply conditions that contributed to high prices.
- Even if spot prices became high for an extended period, with the Forward Market most of the MW volume would be transacted at sustainable forward prices, preventing the large transfers of wealth that pushed utilities toward bankruptcy.
- Finally, suppliers in roughly balanced positions entering the Spot Market would have much reduced incentives to exercise market power, so the behavior of the Spot Market would have likely been less extreme.

1.3 The Greek Case

After more than 12 years of actual operation of the Greek electricity market, it is clear that the **evolution of the liberalization in the electricity sector is at a very critical juncture**. Competition in both the wholesale and retail electricity market has not developed as expected and all parties involved now are called to solve difficult structural problems in a very short amount of time.



During the liberalization process of the past decade, Greek policy makers failed to see the liberalization of the electricity market as an opportunity to modernize the energy sector in general and the public utility in particular, and to improve conditions for operational efficiency and investments, but they accepted it defensively as a "necessary evil" and a consequence of our participation in the European Union.

The Law 3175/2003, which established the daily wholesale electricity market, was implemented without new initiatives but with serious omissions, errors and structural problems. The regulated price regime in Greece did not prove to be clearly defined, transparent and non-discriminatory. In addition, other structural problems in the wholesale market have further eroded the price discovery process with detrimental results for all parties involved. Recently, the rapid penetration of Renewable Energy Sources (RES) and the policy surrounding the RES energy has contributed to further deterioration of the market pricing discovery process. Many hours during the day the prices clear at very low levels. The result is that Producers cannot cover their units' fixed costs from the wholesale market ("missing money problem"). Given that Bilateral OTC Contracts are not allowed and the wholesale market is the only mechanism for the Producers to cover their units' costs, the result is a very toxic climate which has contributed to a flawed wholesale market.

Thus, the Greek electricity Spot Market has been proven inadequate to fulfill the expectations of deregulation, i.e. underpin healthy competition, better services and lower electricity prices. On the contrary, vulnerability to fuel price volatility and amenability to market power abuse dominated the market. **These risks have created an acute need for financial hedging among Participants**. This can be accomplished with the implementation of an efficient medium/long-term pricing mechanism, which will sustain and secure the stability of the market in a significant way.

According to the Greek Law 4425/2016, the set-up for the Greek electricity market shall consist of the Spot (Day-Ahead Market and Intra-Day Market) and Balancing Markets (which will be thoroughly analyzed in the following reports of this Project), complemented with a medium/long-term Forward Market. This Forward Market will partially disengage Participants from the Day-Ahead Market Clearing Price, allowing them to form prices according to their own estimations. The objective of this report is the formation of an applicable Forward Market scheme, which will provide a reliable reference signal to the Participants, while taking into consideration the special characteristics of the Greek electricity market.

In summary, we believe that the overall benefits for the Greek electricity market, upon the introduction and implementation of the Forward Market within the scope of this project, are:

Forward Contracts shall address the price risk by enabling Participants to lock in prices and quantities, thus limiting the exposure to the more volatile Spot Market.



- A Forward Market shall deter market power abuse by providing a substitutional choice of forward contracting, when the Day-Ahead Market Clearing Price is susceptible to strategic behavior; thus, prices shall stabilize and evolve over time with reduced market distortions.
- Forward contracting shall enhance the Greek market's compatibility with longerrange activities, such as system planning for generation, transmission, distribution and demand response investments, by indicating long-term future expectations of hourly market prices.



2 **Power Trading in the Forward Market**

2.1 Introduction

This *Chapter* introduces the fundamentals of trading in electricity Forward Markets and aims to provide essential information on the forward instruments that shall be used in the Greek electricity market.

Section 2.2 provides insights on the deployment of these risk-sharing instruments (Forward Contracts), as tools to manage (mitigate) or hedge price risks, or speculate on price changes. Tangible examples of how Forward Contracts can be used to reduce the price risks within the framework of competitive electricity markets are presented at the end of this *Section,* for this purpose. *Section 2.3* analyzes common traded forward Products, along with detailed product specifications. Typical trading and Settlement procedures of the Forward Market presented in the following *Sections 2.4* and *2.5*, along with tangible examples, conclude the overall introduction.

It should be noted that the scope of this *Chapter* is to lay the foundation on the operation of Forward Markets. The detailed level design of the Greek Forward Market and associated specific features relative to the trading and Settlement procedures are presented in *Chapter 3*.

2.2 Hedging in Forward Electricity Markets

Increased competition in bulk power and retail electricity markets, within the framework of the liberalization of the electricity sector, is likely to affect electricity prices and result in better products and services, but it may also result in greater price volatility.

It is easier to understand the risks of a competitive electricity market by taking a functional view of the industry. Participants in the electricity market may perform one or more of the following functions: generate power (**Producers**), market power (**Marketers** - it refers to the Load Representatives or Traders), and consume power (**Consumers** - it refers to the Self-Suppliers):

- In a competitive environment, some Producers will sell their power in potentially volatile Spot Markets and will be at risk if spot prices are insufficient to cover generation costs.
- Consumers will also face price variability for their commercial businesses and this uncertainty could make it more difficult to assess their long-term financial position.
- Marketers sell electricity to both wholesale and retail consumers, often at fixed prices. Marketers who buy on the Spot Market face the risk that the spot market



price could substantially exceed fixed prices specified in contracts, putting at risk their long-term financial viability.

Electricity Forward Contracts help Producers, Consumers and Marketers manage or hedge price risks in a competitive electricity market.

In the following, a short description of the Forward Contracts and their utility as risksharing instruments within the framework of competitive electricity markets is presented.

2.2.1 Description of the Forward Contract

A Forward Contract is an agreement between two parties by which, one is committed to buy (or sell) a given quantity of a commodity (electricity) at a price specified today, at a given time in the future. It is a standardized Contract where all terms associated with the Forward Transaction (Delivery Period, Place of Delivery, Contract Volume etc.) have been defined in advance, leaving price as the only remaining point of negotiation.

After the opening of a forward position (buying or selling one or more Forward Contracts), as a typical procedure, the Forward Contract is settled every day and is rewritten at a new forward price. As a consequence of that, the daily change in price is credited or debited on the accounts of both the Buyer and the Seller (margin deposit). If the forward price is increased on that day, the difference in price is credited on the Buyer's account, while this difference is simultaneously debited on the Seller's account. This Settlement procedure is known as Mark-to-Market Settlement¹.

During the life of the Forward Contract, any Party can cancel it (close out its forward Position), by selling or re-buying the Forward Contract for the same quantity of the commodity, at the ruling (prevailing) forward price. The balance on the Party's account then reflects the gain or loss of the cancellation.

2.2.2 Purpose of Hedging Using Forward Contracts

To understand the hedging process, as this is related to the Forward Contracts, one must study and analyze the behavior of the price of the Forward Contracts relative to the price of the underlying commodity being hedged.

¹ It should be noted that the settlement procedure may also not be based on a daily Mark-to-Market Settlement, in which case the Mark-to-Market amount is accumulated as daily loss or profit, but is realized only through longer settlement periods (e.g. between the opening and the closing of a forward position) rather than on a daily level. This shall not be applied in the Greek Forward Market.



The most basic point is that **the forward price converges at the time of Maturity to the spot price of the underlying commodity (electricity).** That is, at the last delivery day of the Forward Contract (last day of the Delivery Period), the forward price should equal the current spot price of the commodity, in order the Participants to be able to totally insulate themselves from price changes in the Spot Market and be perfectly hedged. <u>This</u>

"convergence of the forward prices to spot prices" is a fundamental feature of the Forward Markets, and the risk that these prices might not converge is known as the "basis risk" (the "basis risk" is further discussed in *Paragraph 2.2.4*).

Thus, the final settlement in the Forward Market is performed at the spot price, plus the balance on account of both parties: The forward price converges at the time of Maturity to the spot price of the underlying commodity (electricity)

Payoff in the final settlement of the Forward Market = $S_T - F$ (1)

where S_T is the electricity spot price at time T (calculated based on the average Day-Ahead Market price indices over the Delivery Period, as further explained in the following *Sections*) and F the price of the Forward Contract when sold. Although the payoff function (1) appears to be the same as for any Forward Contract, electricity Forward Contracts differ, in that the underlying electricity is a different commodity at different times (electricity is a non-storable commodity).

Within this concept, a Participant can register and conclude a broad range of transactions in the Forward Market. The Forward Market allows the Participant to go long or short, that is, changing Positions, by buying or selling Forward Contracts at any time during the Trading Period of the Forward Contracts.

The purchase of Forward Contracts is used to hedge against increasing power prices (long hedge), while the sale of Forward Contracts is used to hedge against falling power prices (short hedge). At the end, the ultimate Buyers and Sellers of electricity will deliver the physical commodities, but in between, a large number of transactions in Forward Contracts will take place. These operations allow the Participants to benefit from managing their risks with the possibility of sharing them with other parties with inverse risk profiles.

Table 2-1 shows that hedgers mitigate risk by taking **opposite Positions in the Spot and Forward Markets**. A Participant with a long Position in the Spot Market (e.g. a Producer) can hedge by selling a Forward Contract (opening a short Position in the Forward Market). On the other hand, a Participant with a short Position in the Spot Market (e.g. a Load Representative or a Self-Supplier) can hedge by buying a Forward Contract (opening a long Position in the Forward Market).



The fact that the forward Position arrows (hedging arrows) oppose the spot Position arrows, shows that hedgers are insulated from price changes because gains in the spot position are offset by losses in the forward Position, and vice versa. With a perfect hedge, the magnitude of the corresponding gains and losses in the spot and forward Positions will be exactly the same.

	Producer	Load Representative	
Spot position	Long	Short	
Spot Price Increase	Profits increase 1	Profits decrease \downarrow	
Spot Price Decrease	Profits decrease \downarrow	Profits increase \uparrow	
Forward position (hedge)	Short	Long	
Spot Price Increase	Profits decrease \downarrow	Profits increase 1	
Spot Price Decrease	Profits increase 1	Profits decrease \downarrow	

Table 2-1: Hedging Strategies for Producers and Load Representatives

In order the above description to be better understood, the following examples are presented to describe how a Producer, a Consumer and a Marketer can hedge by deploying Forward Contracts. It should be noted, that these examples do not include the actual Settlement procedures in the Forward Market; they are only intended to provide the essential utility of the hedging activities in the Forward Market.

> Example 2.1: A Producer Sells Forward Contracts

Assume that a Producer expects to sell electricity into the Spot Market in six months. The Producer's cost of production is EUR 20 per MWh, the current spot price is EUR 20 per MWh, and the forward price for delivery in six months is EUR 18 per MWh. In this instance, the Producer is long and will lose money if the spot price falls or will make money if the spot price increases.



Figure 2-1: Producer's Hedge

To mitigate this price risk, the Producer could sell Forward Contracts for EUR 18 per MWh. In six months, the Producer would then sell electricity for the spot price and buy Forward



Contracts to close out its forward position (see Figure 2-1). For this example, we assume that the forward price converges with the spot price as the Delivery Period approaches and equals the spot price when the Position is closed.

In this case, the Producer would be perfectly hedged. If the spot price rose to EUR 30 per MWh, the Producer would receive EUR 30 per MWh for selling electricity in the Spot Market, would pay EUR 30 per MWh to close its forward position, and would receive EUR 18 per MWh for its original forward position. By contrast, if the price fell to EUR 10 per MWh, the Producer would receive EUR 10 per MWh for its electricity, would pay EUR 10 per MWh to close out its forward position, and would receive EUR 18 per MWh for its original forward position, and would receive EUR 18 per MWh for its original forward position. In both instances, the Producer ultimately receives EUR 18 per MWh for delivering electricity and is unaffected by price changes of the Spot Market and, therefore, has a perfect hedge with respect to the price risk.

In Figures 2-2, 2-3 and 2-4, the payoff diagrams illustrate the potential outcomes of the Producer's hedged positions if the spot price (x axis) in six months falls to zero or increases to EUR 40 per MWh.



Figure 2-2: Producer's Spot Position

Figure 2-2 shows the potential profits and losses associated with the Producer's spot (physical) position. If the spot price in six months falls to EUR 10 per MWh, the Producer would lose EUR 10 per MWh because its production costs (EUR 20 per MWh) would exceed its payment (EUR 10 per MWh), but if the spot price rises to EUR 30 per MWh, the Producer would make EUR 10 per MWh.





Figure 2-3: Producer's Forward Position

Figure 2-3 shows the potential profits and losses associated with the Producer's forward position. If the spot price in six months falls to EUR 10 per MWh, the Producer would profit by EUR 8 per MWh, because it sold Forward Contracts for EUR 18 per MWh but to close out this Position it bought Forward Contracts for EUR 10 per MWh. If the spot price rises to EUR 30 per MWh, by contrast, the Producer would lose EUR 12 per MWh (EUR 18 - 30 per MWh).



Figure 2-4: Producer's Hedged Position

Figure 2-4 shows the potential profit and loss associated with the combined, or hedged, positions. At each spot market price, the hedged profit is the sum of profits from the spot and forward position. By hedging, the Producer has locked in an electricity price of EUR 18 per MWh and a loss of EUR 2 per MWh. The same result occurs if the Producer is required to physically deliver electricity at EUR 18 per MWh in six months' time.

Figures 2-2, 2-3 and 2-4 illustrate that hedging can guarantee fixed income / cost depending on his position in the market. In this example, the Producer essentially locked in a price of EUR 18 per MWh and a loss of EUR 2 per MWh, because its production costs were EUR 20 per MWh. If the forward price were EUR 22 per MWh, the Producer could have locked in a higher price and guaranteed itself a profit.

The risks associated with this hedging activity are that the forward price would not



converge to the spot price on the Delivery Period, or the Producer would miscalculate and have less (or more) electricity than initially had anticipated. These risks are further explored in greater detail in Section 2.2.4.

> **Example 2.2:** A Consumer Buys Forward Contracts

In this example, assume that a Consumer (e.g. a large industrial self-supplying consumer) anticipates that it needs electricity in six months and intends to buy it in the Spot Market at that time.

The current spot price is EUR 20 per MWh and the forward price for delivery in six months is EUR 18 per MWh. In this instance, the Consumer is short and will pay more for electricity if the spot price rises and pay less if the spot price decreases.



Figure 2-5: Consumer's Hedge

To mitigate this price risk, the Consumer could buy Forward Contracts for EUR 18 per *MWh* to lock in its electricity price. In six months, the Consumer would then buy electricity for the spot price and sell Forward Contracts to close out its forward position again at the spot price (see Figure 2-5). Again, we assume that the forward price converges at the spot price as the Delivery Period approaches and equals the spot price when the Position is closed.

In this case, the Consumer would be perfectly hedged. If the spot price rises to EUR 30 per MWh, the Consumer would pay EUR 30 per MWh for its electricity in the Spot Market, would receive EUR 30 per MWh to close its forward position from the Forward Market, and would pay EUR 18 per MWh for its original forward position. By contrast, if the price fell to EUR 10 per MWh, the Consumer would pay EUR 10 per MWh for its electricity in the Spot Market, would receive EUR 10 per MWh to close out its forward position, and would pay EUR 18 per MWh for its original forward position. In both instances, the Consumer ultimately pays EUR 18 per MWh for electricity and is not affected by the price volatility in the Spot Market.

In Figures 2-6, 2-7 and 2-8, the payoff diagrams illustrate the potential outcomes of the Consumer's hedged positions if the spot price in six months falls to zero or increases to EUR 40 per MWh.





Figure 2-6: Consumer's Spot Position

In this example, we assume that the Consumer has fixed contracts with its customers and can pass on only EUR 20 per MWh to them. If the spot price converges with the forward price, the Consumer will be perfectly hedged and not affected by price changes in the Spot Market, because the gains (losses) in the Spot Market are exactly offset by the losses (gains) in the Forward Market.



Figure 2-7: Consumer's Forward Position



Figure 2-8: Consumer's Hedged Position

In particular, if the Consumer locks in a price of EUR 18 per MWh and is able to pass on



electricity prices of EUR 20 per MWh, it stands to make a profit of EUR 2 per MWh.

> Example 2.3: A Marketer Buys and Sells Forward Contracts

Marketers are likely to both buy and sell electricity Forwards. Assume that a Marketer (e.g. a load representative) has guaranteed customers to whom it will deliver electricity in six months. In this instance, the Marketer could buy Forward Contracts for EUR 18 per MWh and sell the end use customers electricity at a small mark-up, say EUR 18.10 per MWh (see Figure 2-9).

If the spot price rises to EUR 30 per MWh in six months, the Marketer would buy electricity in the Spot Market for EUR 30 per MWh and deliver it to the customers for EUR 18.10 per MWh (for a loss of EUR 11.90 per MWh on the spot transaction). At the same time, the Marketer would close out its forward position by selling Forward Contracts for EUR 30 per MWh (for a gain of EUR 12 per MWh over the original purchase price of EUR 18 per MWh). This transaction guarantees the end use customer fixed price power at EUR 18.10 per MWh and, if the spot price converges with the forward price, guarantees the Marketer a profit of EUR 0.10 per MWh.

This transaction is identical to the Consumer hedge, which was presented in the previous example, with the exception of the fee collected by the Marketer. End use customers prefer this arrangement because they may not understand forward instruments.



Figure 2-9: Marketer's Long Hedge

Marketers can buy as well as sell electricity. Assume that a Marketer (e.g. a trader) agrees to buy electricity from a Producer at a fixed price in six months. The Marketer could agree to buy electricity for EUR 17.90 per MWh and sell electricity Forwards for delivery in six months for EUR 18 per MWh, thus locking in the fixed price and a profit (see Figure 2-10).



In six months, if the spot price has increased to EUR 30 per MWh, the Marketer would pay the Producer EUR 17.90 per MWh for the power, sell the power on the Spot Market for EUR 30 per MWh, making EUR 12.10 per MWh on the spot transaction.

At the same time, the Marketer would close out its forward position by buying Forward Contracts for EUR 30 per MWh, thus losing EUR 12 per MWh on its forward position. The combined spot and forward positions leave the Marketer with a profit of EUR 0.10 per MWh.

This transaction is identical to the Producer's hedge presented in the first example, except that the Marketer takes a profit. Like the end use customer, a Producer might be interested in selling electricity through a Marketer to receive a fixed price and to avoid the real or perceived uncertainties associated with hedging using Forwards.



Figure 2-10: Marketer's Short Hedge

2.2.3 Speculating Using Forward Contracts

We should note that Producers, Consumers and Marketers could also speculate using Forward Contracts.

That is, Participants could intentionally speculate in the Forward Market in an effort to make a profit. They could also unintentionally speculate if, for example, they bought Forward Contracts to hedge their purchase of electricity in six months, but found that they did not need the electricity at that time.

We present a simple example involving a Producer:

> Example 2.4: A Producer Speculates in the Forward Market



Assume that a Producer might anticipate having a surplus of electricity in six months and therefore sells a Forward Contract, but then needs that surplus to serve its existing customers, because of an increase in demand or due to plant outages. Speculation simply requires that the Producer closes out its forward position without having an offsetting physical transaction in the Spot Market. The Producer would lose money if the price of electricity increased and would make money if the price of electricity decreased at the time that the Producer closed out its forward position. The utility could either make or lose money on this speculative transaction.

The Producer could also intentionally speculate in the Forward Market. If the Producer thought that the spot price of electricity would increase, he would buy electricity Forward Contracts (see Figure 2-11). If the electricity price increased, the Producer would receive this higher amount when he sold the Forward Contract to close out his Position (e.g. before the Delivery Period of the relevant Forward Contract) and would pay the lower price for the Forward Contract that he originally bought. This speculative transaction would leave the Producer with a profit. By contrast, if the Producer expected prices to fall, he would sell Forward Contracts.

If spot price is expected to increase



Figure 2-11: Producer's Speculative Positions

2.2.4 Risks associated with Hedging Using Forward Contracts

As already discussed, the forward price and the spot price should converge near or on the Delivery Period. This should occur because, if the two prices are different, arbitrage would be expected to occur to eliminate the difference.



For example, if the forward price was EUR 22 per MWh, but the spot price was EUR 20 per MWh near the Delivery Period, then an arbitrager should be able to buy electricity in the Spot Market for EUR 20 per MWh, sell a Forward Contract for EUR 22 per MWh, and secure a profit of EUR 2 per MWh. In theory, increased demand in the Spot Market should drive up the spot price and increased supply in the Forward Market should drive down the forward price, until the spot and forward prices are equalized. In practice, the two prices may not exactly converge if, for example, delivery is difficult and prevents arbitragers from taking advantage of the price differences.

Thus, the primary risk associated with Forward Contracts is that the forward price and the spot price will not converge during the Delivery Period. The difference between the forward price and the spot price of the underlying commodity being hedged is known as "basis". The chance that these will not converge is known as "basis risk". Basis risk can occur because of differences in location or time:

1) One type of "basis risk" occurs because of **location-specific factors** (e.g. differences in transmission costs). Consider the following example:

Consider the Spot and (physical) Forward Markets in France and Belgium. The spot price of electricity in France is not likely to always be the same as the spot price in Belgium, in which case using a Forward Contract in the Belgian Forward Market would not perfectly hedge the price risk in France. More specifically, assume that a Producer expects to sell electricity into the Spot Market of France in six months, and selects to sell a Forward Contract in the Belgian Forward Market for EUR 18 per MWh. On the Delivery Period, the spot price in France is EUR 25 per MWh, but the spot price in Belgium is EUR 28 per MWh. If the Producer was able to deliver electricity to Belgium, it would do so and collect EUR 18 per MWh. If the Producer was not able to deliver electricity to Belgium, it would sell into the French Spot Market at EUR 25 per MWh and close its forward position in Belgium by buying a Forward Contract for EUR 28 per MWh. As a result of this transaction, the Producer receives EUR 25 per MWh for his electricity in the French Spot Market, but loses EUR (28 -18) = 10 per MWh on his forward position in Belgium and ultimately receives only EUR (25 - 10) = 15 per MWh, not EUR 18 per MWh for his electricity as initially planned. If the French electricity price (spot price) were perfectly correlated with the Belgian electricity price (spot price), the Producer would be perfectly hedged. But if the prices in the two markets are not well correlated, this will undermine the Producer's hedge.

Of course this risk only exists in case the participant participates in the Forward Market of a different Bidding Zone than the one he actually delivers electricity, while it is not incurred in case the participant's forward position is settled in the spot price of the same Bidding Zone he actually delivers electricity.

2) Another reason that the spot and forward prices might not converge is that the **forward commodity might be different from the spot commodity**. This could be a problem if for example the Forward Market settles the contracts at the end of the



month prior to the delivery month (usually Forward Contracts call for delivery over an entire month).

For example, a Producer sells a month Forward Contract, then buys back the Forward Contract at the end of the month prior to delivery (final settlement) to close out its forward position, but then must sell in the Spot Market during the following month. There is no guarantee that the forward price on e.g. May 28 for June delivery will be the same as the spot price received for electricity on a daily basis throughout the month of June. As a result, the Producer's hedge may be undermined.

This risk is abolished by setting the final settlement of the Forward Market to take place at the end of the delivery month, with the Final Settlement Price to be the average spot (Day-Ahead Market) price over the given Delivery Period (as already discussed, detailed settlement features for the Greek case will be further elaborated in *Chapter 3*). Thus, "convergence to spot prices" is achieved.

3) Another risk associated with using Forward Contracts is that the Producer, Consumer or Marketer could miscalculate the amount of electricity that they will generate or need (this case has also been discussed in *Paragraph 3.2.3*).

For example, a utility Producer might anticipate having a surplus of electricity in six months and therefore sells a Forward Contract, but then needs that surplus to serve its existing customers, because of an increase in demand or due to plant outages. If this occurs, the utility would be speculating in the Forward Market. That is, the utility Producer would have closed its Position in the Forward Market without having an offsetting physical transaction in the Spot Market. If the utility had sold a Forward Contract for EUR 18 per MWh, the utility would lose money if the price of electricity increased and would make money if the price of electricity decreased at the time that the utility closed out its forward position. The utility could either make or lose money on this speculative transaction.

2.3 Forward Contract Specifications

In order to be able to further elaborate on the trading and Settlement procedures of the Forward Market, we first need to focus on the specifications of the Contracts used in such market.

The following Forward Contracts are the most common Products that can be traded on the electricity Forward Market:

- Baseload Standard Month/Quarter/Year Contracts
- Peakload Standard Month/Quarter/Year Contracts
- Off-peak load quarter/year Forwards



Forward Contracts are characterized by the following **properties**:

1. <u>Delivery Period</u>: The Delivery Period describes the period of the power delivery, on which the Forward Contract is based. Delivery Periods, which are usually traded on electricity Forward Markets, are months, quarters and years.

2. <u>Load Profile:</u> The Load Profile describes the Delivery Rate (volume of power per hour) at which the power delivery on which the Forward Contract is based, is effected. Load Profiles that can be traded are baseload, peakload and off-peak load:

- **Baseload** comprises a constant Delivery Rate on all delivery days, from Monday to Sunday, and during all 24 delivery hours of a delivery day during the Delivery Period.
- **Peakload** comprises a constant Delivery Rate on all delivery days, from Monday to Friday, and during 12 delivery hours from 08:00 (am) to 20:00 (pm) of a delivery day during the Delivery Period.
- **Off-peak load** is the difference between baseload and peakload. This Load Profile comprises the delivery days from Monday to Friday, from 0:00 (am) to 08:00 (am) and from 20:00 (pm) to 24:00 (pm), as well as the time from 00:00 (am) to 24:00 (pm) from Saturday to Sunday.

3. <u>Place of Delivery:</u> The Place of Delivery describes the Bidding Zone, within the Transmission System, of the delivery of power on which the Forward Contract is based.

4. <u>Contract Volume</u>: The Contract Volume describes the quantity of power on which a Forward Contract is based. The Contract Volume corresponds to the product of *"Delivery Rate x delivery days x delivery hours/day"*.

The Delivery Rate (power volume per hour) of common Forward Contracts is 1 MW. This e.g. results in the Contract Volume, for a baseload month Forward Contract, for the delivery month of September, of "1 MW x 30 days x 24 h/day = 720 MWh".

The Contract Volume of baseload Forward Contracts takes account of additional or reduced volumes of 1 MWh caused by the switch from daylight saving time to standard time and vice versa.

5. <u>**Quotation:**</u> Prices for a Forward Contract in European electricity Forward Markets are specified in EUR per MWh, commonly with two digits after the decimal point. This means the smallest price change is EUR 0.01 per MWh.

6. <u>Tradable Delivery Periods:</u> Forward Contracts, each of which have several Delivery Periods in the future, can usually be traded.



For example, the following tradable Delivery Periods can be considered with regard to Standard Month, Quarter and Year Forward Contracts: the respective next six (6) months into the future, the respective next four (4) full quarters into the future, and the respective next one (1) full year into the future.

7. <u>Expiry Day:</u> Expiry Day is the last day of trading (also referred as Last Trading Day). For example, Standard Year Forward Contracts and Standard Quarter Forward Contracts may reach expiry three Trading Days before the beginning of the Delivery Period.

Standard Month Forward Contracts, depending on the formation of the Forward Market, can reach their expiry either before the beginning of the Delivery Period [see case (1) in *Figure 2-12*], or at the end of the Delivery Period [see case (2) in *Figure 2-12*]. In the second case Standard Month Forward Contracts remain tradable during the delivery month. In any case, final Settlement is effected after the Expiry Day, on the basis of the corresponding month index at the end of the month. For the Greek Forward Market, the 1st above option (Expiry Day before the beginning of the Delivery Period) shall be applied.



Figure 2-12: Trading Periods for Month Forwards

2.4 Settlement Procedures in the Forward Market

In this Section, we lay the foundations on the Settlement procedures concerning the electricity Forward Market. It should be noted that the Section aims to provide



essential information on the typical Settlement procedures, as these are implemented on many European Forward Markets. The specific features and further elaboration on the Greek Forward Market is provided in *Chapter 3*.

Forward Contracts are settled by means of Physical Settlement. This means that during the Delivery Period there is obligation for Physical Delivery (injection/withdrawal of the electricity underlying each Forward Contract into/from the Transmission System, by the Seller/Buyer of the Forward Contract). In order to guarantee the highest possible likelihood of execution, Physical Delivery is effected

Power Forwards are settled by means of Physical Delivery which is ensured through "price taking" orders in the Day Ahead market

through "Priority Price-Taking" Orders (Orders with priority in market clearing) in the Day-Ahead Market. The Orders in the Day-Ahead Market are considered binding. Thus, the Participant combines the financial fulfillment of its forward Positions, with a Physical Delivery of the quantity of power that is established contractually. This enables the Participant to divide its trading activities in terms of fulfillment of its forward Positions and portfolio optimization.

As far as the Financial Settlement of the forward Positions is concerned, the Seller and the Buyer of each Forward Contract receive payments of money or have to effect such throughout the entire period, from the opening of the Position until the end of the Delivery Period or until the Position is closed. The amount of payments is established on the basis of the difference between two consecutive settlement prices multiplied by the Contract Volume and the number of Forward Contracts.

More specifically, every day, the Forward Market specifies, based on pre-determined rules, a Daily Settlement Price for every Forward Contract. The change in the value of the forward Position, which results from the change in the settlement price between the last and the current Trading Day, <u>namely the Variation Margin</u>, is credited to the Participant in cash or debited in cash². In this context, the value of a forward Position is calculated as the product of *"Forward Contracts x Contract Volume x Daily Settlement Price"*.

> <u>A simple Numerical Example</u>

Assume that the following Forward Transaction has been made on Trading Day D of the year 2012: a Producer has sold 30 Forward Contracts in the baseload Standard Year Contract for the following year 2013, for EUR 18 per MWh (opening of a short position in

² It refers to the Mark-to-Market settlement procedure. Nevertheless, as already discussed, the settlement procedure may also not be based on a daily Mark-to-Market Settlement, in which case the Mark-to-Market amount is accumulated as daily loss or profit, but is realized only through longer settlement periods (e.g. between the opening and the closing of a forward position) rather than on a daily level. As discussed above, this shall not be applied in the Greek Forward Market.



* <u>The Cascading Mechanism</u>

In the case of Standard Year and Standard Quarter Contracts, the Daily Settlement Price on the Expiry Day is the Final Settlement Price and defines the value of the Position to be cascaded, so that the Standard Year and Standard Quarter Contracts regulated through are а Cascading Mechanism.

More specifically, in its common use the

Cascading means that Forward Contracts with longer Delivery Periods are replaced by equivalent Forward Contracts with shorter Delivery Periods on the Expiry Day (Last Trading Day).

Cascading Mechanism provides that, at the end of the trading session of the Expiry Day, the Positions on a Standard Year Contract are split into equivalent Positions on contracts of shorter Maturity (Standard Month Contracts for January, February and March and Standard Quarter Contracts for the second, third and fourth quarter of the year). Likewise, a Position on a Standard Quarter Contract is converted into equivalent Positions on the three corresponding Standard Month Contracts (see *Figure 2-13*).

Every Cascading is effected by closing the Position in Standard Year or Standard Quarter Forward Contract to be cascaded and simultaneously opening several equivalent Positions in Forward Contracts with shorter Delivery Periods. In this case, the Positions are closed at the Final Settlement Price (i.e. the Daily Settlement Price on the Expiry Day) of the Standard Year or Standard Quarter Forward Contract, and the equivalent new Positions in Forward Contract with a shorter Delivery Period are opened at the same price. As a result of this, Variation Margins are incurred for the closed Position and, additionally, for all newly opened Positions on the Cascading Day.





Figure 2-13: Cascading Mechanism

In our example, assume that the Final Settlement Price of the baseload Standard Year Forward Contract on the Expiry Day (e.g. three Trading Days before the beginning of the delivery year) is EUR 20 per MWh. Until this day, a total Variation Margin of "30 x 1 MW x 365 days x 24 h/day x (20-18) \notin /MWh = 525,600 \notin " has been debited to the Producer and credited to the Consumer. On that day, the Producer's short Position and the Consumer's long Position in the baseload Standard Year Forward Contract are replaced by equivalent Positions in Standard Month Forward Contracts for January, February and March and Standard Quarter Forward Contracts for the second, third and fourth quarter of the year 2013, whose Delivery Periods taken together correspond to the year. All new Positions are opened at the price of EUR 20 per MWh. If the Daily Settlement Price of the Standard Month Forward Contract for the month January on the Cascading Day is EUR 19 per MWh, a Variation Margin of "30 x 1 MW x 31 days x 24 h/day x (20-19) \notin /MWh =22,320 \notin " is also incurred, which shall be credited to the Producer and debited to the Consumer. Variation Margins are incurred accordingly for all newly opened Positions.

Note that, in our example, the Settlement procedure is supposed to involve a daily Markto-Market Settlement. That is, Open Positions on Forward Contracts are subject to Daily Market Settlement, which covers gains or losses from day-to-day changes in the market price of each Forward Contract, on each Business Day from the opening of the Position until the Expiry Day. In this case, the price of all cascaded Forward Contracts is the Daily Settlement Price on the Cascading Day, since the total Variation Margin between the original contract price (original price of the transaction when the Position was opened) and



the Daily Settlement Price on the Cascading Day has already been debited or credited to the Participants.

* <u>Settlement of Standard Month Forward Contracts</u>

We have two options about the Expiry Day of the Standard Month Forward Contracts. Standard <u>Month Forward Contracts</u>, as already discussed, can reach their expiry either before the beginning of the Delivery Period [see case (1) in Figure 2-12], or at the end of the Delivery Period [see case (2) in Figure 2-12].

In the first case Standard Month Forward Contracts are not tradable during the delivery month, while in the second case Standard Month Forward Contracts remain tradable during the delivery month. Accordingly, while in the second case the Mark-to-Market settlement procedure continues during the delivery month, based on Variation Margins that are incurred due to the difference between two consecutive Daily Settlement Prices (forward prices) of the delivery month, in the first case a daily spot referenced settlement takes place after the Standard Month Forward Contract reaches its Expiry Day, based on the spot prices (Day-Ahead Market prices) of each day of the delivery month.

As discussed above, the 1st option (Expiry Day before the beginning of the Delivery Period) shall be applied in the Greek Forward Market. The exact implementation of the 1st option is described analytically in Chapter 5 of this report.

In any case, the price established to be used for closing the Positions on the day before the last delivery day of the delivery month is the Final Settlement Price. The Final Settlement Price is established on the basis of the average of all daily Spot Market indices of the Day-Ahead Market's auctions for the specific Bidding Zone

and for the delivery days of the corresponding delivery month. As a result, the Final Settlement Price of the Standard Month Contract (thus, the ultimate settlement price for any Forward Contract, since both Standard Year and Standard Quarter Forward Contracts finally cascade in Standard Month

By setting the Final Settlement Price to be the average spot price over the given Delivery Period, "convergence to spot prices" is achieved

Forward Contracts) is the price at which the procurement of power could have been achieved in the Day-Ahead Market for a given month and a given Load Profile.

This fundamental feature of Forward Markets was discussed in *Section 2.2*; it gives hedgers the capability of totally insulating themselves from price changes in the Spot Market of a specific Bidding Zone (their physical position on the Spot Market can be totally offset by their forward position, leaving them unaffected by price changes). The Final Settlement Price constitutes the basis for the calculation of the final Financial Settlement. This last payment is also a Variation Margin. Afterwards, the month Forwards are considered fulfilled.



The following example is intended to illustrate the functional principle of a hedging transaction with the help of a baseload Standard Month Forward Contract, assuming that the Standard Month Forward Contract remains tradable during the delivery month, until final settlement is effected on the basis of the corresponding month index at the end of the month.

Example 2.5: A Producer Sells 30 Contracts on a Baseload Standard Month Forward Contract

A generating company (Producer) is planning to sell power generated by its plant in the month of November 2013 (24 hours, 30 days) in the Day-Ahead Market via hourly contracts. It expects an average price of EUR 53.50 per MWh. Since the Day-Ahead Market price cannot be predicted with certainty, it decides to conclude a price hedging transaction on 1 July 2013 by selling 30 Contracts (i.e. 30 MWs) of the baseload month Forward for November 2013 at EUR 53.50 per MWh. The planned revenue from the delivery of power amounts to "30 MW x 24 h/day x 30 days x EUR 53.50 per MWh = EUR 1,155,600".

The generating company sells approximately 30 MW per hour beginning on 31 October 2013 for the first delivery day (1 November 2013) and ending on 29 November 2013 for the last delivery day (30 November 2013) as planned. This means it submits "price taking" offers (offers with priority in market clearing) in the Day-Ahead Market for each one of the delivery days in November, with the result that it sells the 30 MW in every hour at the respectively applicable Day-Ahead Market price. As a result, it achieves a price exactly corresponding to the average value of the daily spot market index.

However, assume now that the average price in the Day-Ahead Market has fallen below the planned value of EUR 53.50 per MWh, say EUR 47.53 per MWh. The generating company now only earns EUR 47.53 per MWh on average on the Day-Ahead Market and, this result falls short of the expected revenue by EUR 128,952. However, the profits (Variation Margins) from the Forward Contract totalling EUR 128,952 offset exactly this shortfall in revenue of EUR 128,952.

This clearly shows that the planned revenue totalling EUR 1,155,600 was fixed upon the conclusion of the Forward Transaction. It consists of the revenues from the Day-Ahead Market, totalling "21,600 MWh x EUR 47.53 per MWh = EUR 1,026,648" and of the revenues from the Forward Market, totalling "21,600 MWh x (EUR 53.50 per MWh – EUR 47.53 per MWh) = EUR 128,952".

If we assume an Additional Margin parameter of EUR 2.00 per MWh (see Section 2.6 for the Additional Margin), the generating company in our example, from 1 July 2013 (opening of Position) to 29 November 2013 (Expiry Day) has to deposit an Additional Margin for the Position in the baseload month Forward, amounting to "30 MW x 24 h/day x 30 days x EUR 2.00 per MWh = EUR 43,200" with the Clearing House. If applicable, the generating



company also collects in addition a value-added tax, totalling e.g. "EUR 1,026,648 x 13% = EUR 133,464.24" upon the sale in the Spot Market.

Of course, an increase in the average Day-Ahead Market price is also possible, so that, in our example, the generating company would generate higher revenue on the Day-Ahead Market. In this case, the generating company would incur losses on the Forward Market, which would reduce its total revenue to exactly the planned amount of EUR 1,155,600 once again.

Table 2-2 illustrates the course of payments to the generating company (Forward seller) in our example, from 1 July 2013 (opening of Position) to 29 November 2013 (Expiry Day).

Specifically, prices in the second column are the Daily Settlement Prices of the Forward Contract, while prices on the third column are the average Day-Ahead Market prices of the 24 hours (baseload) of each delivery day, starting from the preceding day (Thu, 31/10/13) of the first delivery day of the delivery month November. Each one of the fourth column's prices is the average of all preceding Day-Ahead Market prices until the day concerned [for example on Mon, 04/11/13 the said price is EUR (48.00 + 48.20 + 46.40 + 46.40 + 43.00) per MWh / 5 = EUR 46.40 per MWh). Finally, the fifth column shows the Variation Margins for the generating company arising from daily Mark-to-Market Settlement of the Forward Contract [for example the Variation Margin of We, 30/10/13 is EUR (48.20 - 48.00) per MWh x 30 MW x 24 h/day x 30 days = EUR +4,320"]. It should be noted once again, that in this example we assume that the month Forward remains tradable during the delivery month and the Mark-to-Market Settlement procedure continues until the final spot referenced settlement at the end of the delivery month.

Trading Day		Daily Settlement Price of the Forward [€ per MWh]	Baseload Day- Ahead Market price [€ per MWh]	Average Baseload Day- Ahead Market price [€ per MWh]	Variation Margin [€] (-) Debit (+) Credit
Τ.	Mo, 01/07/13	53.50	-	-	0
var c ding					
Forv Trai	Tue, 29/10/13	48.20	-	-	+114,480
	We, 30/10/13	48.00	-	-	+4,320
g	Thu, 31/10/13	47.00	48.00	48.00	+21,600
ndin	Fri, 01/11/13	47.50	48.20	48.10	- 10,800
Tra	Sat, 02/11/13	-	46.40	47.53	-
oot	Sun, 03/11/13	-	46.40	47.25	-
d & Sp	Mon, 04/11/13	46.90	43.00	46.40	+12,960
var	Tue, 26/11/13	47.80	38.00	44.30	- 19,440
orv	We, 27/11/13	48.30	48.00	45.04	- 10,800
Ľ	Thu, 28/11/13	48.00	53.00	46.37	+6,480


Fri, 29/11/13	Final Settlement Price: 47.53	54.50	47.53	+10,152
			Total:	+128,952

Table 2-2: Example - Course of Payments for a Producer Selling 30 Baseload Month ForwardContracts for November 2013

Upon opening of the forward position, the price of the planned sale on the Day-Ahead Market is already established at EUR 53.50 per MWh in advance. This is accomplished by using the average Day-Ahead Market price (EUR 47.53 per MWh) as the Final Settlement Price of the Forward. This guarantees that no Participant can take advantage by doing arbitrage between the Final Settlement Price of the Forward and the average Day-Ahead Market price (Plannet Price) and the average by doing arbitrage between the Final Settlement Price of the Forward and the average Day-Ahead Market price.

2.5 Trading Procedures in the Forward Market

European electricity Forward Markets are fully electronic markets with trading platforms for the conclusion of the Forward Transactions.

Participants transfer Orders (Bids and Offers), under unique identification codes, from their respective workstations to the Trading Systems of the Forward Market by means of electronic transmission. The Trading Systems are responsible for storing of Orders, ranking of Orders and execution of all transactions.

* <u>Trading Days and Hours</u>

Participants may within the trading hours on any Trading Day submit Orders (Bids and Offers) for the relevant Product and enter into transactions through the Trading System. The Trading Days on which continuous trading generally takes place, are Monday to Friday (excluding public holidays), while trading hours on a specific Trading Day usually cover the period from 08:00 (am) to a specific point in time at noon (e.g. 15:30 pm).

Trades are published in real-time and all trading and clearing activity is performed anonymously.

Priority Rules

During continuous trading, prices are determined by matching opposite Orders at the best possible Bid and Offer prices ("price priority"). <u>This means that the Trading System</u> ranks the Orders initially according to their price. The highest Bid price and the lowest Offer price are ranked first. Orders without a price limit are given first priority at all times.



The priority order in the same price level is the time when the Order was entered into the Trading System ("**time priority**"). <u>This means that where the prices are identical, the chronological order of entry is determinative.</u>

Each new incoming Order (Bid or Offer), after having successfully been validated by the appropriate risk management processes, is immediately checked for execution against opposite registered Orders (Offers or Bids) in the Trading System. For example, the registered Bid (Offer) with the first priority shall normally become matched, and a corresponding transaction shall be created, upon the registration in the Trading System of an Offer (Bid) with a corresponding or lower (higher) price than the Bid (Offer).

Order Types

Electricity Forward Markets can generally accept the Order types listed in the following *Tables 2-3* and *2-4* for their listed Products.

An Order is generally valid from the time of registration in the Trading System until it is matched, canceled or amended, or has expired, and it can usually be executed in full or partially, in one or more steps, pursuant to its individual "execution (validity) specifications".

The Trading System stores Orders in electronic **Order Books**, in case these Orders, according to their "execution specifications", are not executed or deleted from the Trading Systems straight away. Orders in the Order Book can usually be changed or deleted at any time.

The minimum contents of an Order submitted to the Trading Systems by a Participant are usually the following:

- Identity of the Participant submitting the Order,
- Product & Place of Delivery,
- Bid or Offer (if the contract is to be bought or sold respectively),
- Order volume (number of Contracts),
- Order type and possible "execution specifications" for the Order,
- Order price (unless the Order is a Market Order),
- If applicable: any additional information as mandated by the trading rules or the prevailing functionality of the Trading System.

Tables 2-3 and *2-4* provide the description and the utility of a variety of Order types and "execution specifications".



The tradable Order types and "execution specifications" for the Greek Exchange-Based Forward Market are presented in detail in *Chapter 4*.

Order Types			
Market Order (Unlimited Order)	Market Orders are Bids or Offers which are entered <u>without a price limit</u> and are to be executed at the best available price in the Trading System. Market Orders do not allow any control over the price received, therefore, this Order type is used when certainty of execution is a priority over price of execution.		
	Limit Orders are Bids or Offers which are entered with a price limit and which are executed at this price limit or better.		
Limit Order (Limited Order)	More specifically, a Limit Order is an Order, to buy (Bid) or sell (Offer), at a maximum purchase price or a minimum selling price. A Limit Order is stored in the Order Book in descending buy-price order or ascending sell-price order and joins the queue of Orders having the same price according to time priority. If the limit price specified is not valid according to the allowed Tick Sizes, the Limit Order is rejected.		
	Limit Orders allow control over the price received; however, the Order may never be executed, therefore, this Order type is used when price of execution is a priority over certainty of execution.		
Linked Order	A Linked Order is a <u>combination of two or more individual Orders</u> , entered in the Trading Systems simultaneously, which have the same number of Contracts. The execution of the individual components is interdependent. When a trade takes place in one of the "legs" (individual Orders), the volume of the other "legs" will immediately be reduced proportionally, so there will be no risk of "double trading". In this context, Linked Orders come with an exclusive OR-condition on the maximum volume level.		
	For example, a Participant can use a Linked Order to enter more than one individual Orders and to state that he wants to buy e.g. either 10 MW of Product X at price A, OR 10 MW of Product Y at price B, OR a combination thereof. Linked Orders increase the possibility for a Participant to fill his Order by trading different Products.		
One Cancels the Other (OCO) Order	OCO Orders are used when the Participant wishes to execute only one of two or more individual Orders . When one Order is executed, the other(s) is (are) automatically canceled.		
(,	For instance, the Participant may wish to buy either 10 MW of Product X at price A, OR 10 MW of Product Y at price B. In this case, he would execute an OCO		



	Order composed of two parts: A Limit Order for 10 MW of Product X at price A, and a Limit Order for 10 MW of Product Y at price B. If Product X reaches price A, the Limit Order of Product X would be executed, and the Limit Order of Product Y would be canceled.
	A Stop Order is an Order that is submitted automatically as a Market Order or a Limit Order once a certain price condition in the Market for the specified Product is met. The price condition is predefined by the user ("stop limit"). A Stop Order is not visible to the market before it is converted to a Market or Limit Order. A Stop Order can be one of the following types:
	<u>Regular Stop Order</u> : According to the "buy high - sell low" principle, a Bid is submitted to the market as a Market Order when the price for a Product rises to a specified level ("stop limit") and an Offer is submitted to the market as a Market Order when the price falls to a specified level ("stop limit").
	In this context, the Stop Order is used to minimize a loss on a short or a long position, by closing out the Position at any price. More specifically, Participants use Bid Stop Orders to limit a loss on a Product that they have already sold (short position). On the other hand, Participants use Offer Stop Orders to limit a loss on a Product that they have previously bought (long position).
Stop Order	Stop Limit Order: A Stop Limit Order combines the features of a Regular Stop Order and a Limit Order. It lists two prices (the "stop limit" and the "price limit") and is an attempt to gain more control over the price at which the stop is filled. Once the "stop limit" is reached, the Stop Limit Order becomes a Limit Order to buy (or to sell) at no more (or less) than another, pre-specified "price limit".
	More specifically, according to the "buy high - sell low" principle, a Bid is submitted to the Market as a Limit Order when the price for a Product rises to a specified level ("stop limit") and an Offer is submitted to the Market as a Limit Order when the price falls to a specified level ("stop limit"). The "price limit" indicates that once the stop is triggered, the Participant does not wish to be filled beyond the "price limit".
	Market if Touched Stop Order (MIT): MITs are the opposite of Regular Stop
	Orders. According to the "buy low - sell high" principle, an Offer is submitted to the market as a Market Order when the price for a Product rises to a specified level ("stop limit") and a Bid is submitted to the market as a Market Order when the price falls to a specified level ("stop limit").
	A MIT Order is similar to a Limit Order in that a specific price is placed on the Order. However, a MIT Order becomes a Market Order once the "stop limit" is touched or passed through. An execution may be at, above, or below the originally specified price ("stop limit"). A MIT Order will not be executed if the market fails to touch the MIT specified price ("stop limit"). A MIT Order is usually used to enter the market by initiating a short or a long position.



Table 2-3: Orders in the Trading Systems of Forward Electricity Markets

Order's Execution (Validity) Specifications		
Day or Good-for-Day Order (GFD)	A GFD is valid for the specific Trading Day on which it was submitted. Unless it is partly or entirely fulfilled by the end of this Trading Day (market closure), it will be automatically canceled by the Trading System.	
Good-till-Canceled (GTC) Order	A GTC is <u>valid until it is canceled</u> (it also requires a specific canceling Order). Unless previously canceled or matched, GTC Orders remain valid until the end of the Expiry Day of the Contract, when they are automatically canceled.	
Good-till-Date (GTD) Order	A GTD is <u>valid until a date specified in the Order</u> . Unless canceled or matched by the specified date, GTD Orders remain valid until the specified date and are automatically canceled by the Trading System at the end of that date. The Trading System does not accept Orders with dates further than the Expiry Day.	
Immediate-or-Cancel (IOC) or Fill-and-Kill (FAK) Order	IOC Orders are <u>executed immediately</u> upon entry into the Trading System, <u>to</u> <u>the extent possible</u> depending on the opposite Orders waiting in the system, <u>with the unexecuted part canceled</u> . Unlike FOK Orders, IOC Orders allow for partial fills. No IOC Orders are stored in the Order Book during continuous matching.	
Fill-or-Kill (FOK) Order	FOK Orders are <u>executed immediately</u> upon entry into the Trading System, <u>in</u> <u>full, or canceled all together</u> . Unlike IOC Orders, FOK Orders require the full quantity to be executed. No FOK Orders are stored in the Order Book during continuous matching.	
All-or-None (AON) Order	AON Orders are executed in their entirety, or not executed at all . Partial execution is not acceptable. AON Orders are similar to FOK Orders, but the former focuses on "complete vs. partial fulfillment", whereas the latter hinges on the immediacy of the transaction.	
Hidden Volume or Iceberg Order	Hidden Volume Orders include <u>an executable volume of the Product that is</u> <u>only partially visible</u> to the Market, <u>leaving a hidden quantity divided into</u> <u>smaller parts</u> "below the surface". More specifically, the total volume of the Order is divided into smaller parts, with only one part being displayed in the Order Book. Both the displayed (visible) and non-displayed (hidden) parts of the Order are available for potential execution against incoming Orders. The displayed part is automatically refreshed from a non-displayed part, once the displayed part is fully executed. Refreshing the displayed part is regarded as a new Order from a "time priority" point of view.	



amounts of a Product, they can divide their large Orders into smaller parts so that the public sees only a small portion of the Order at a time (just as the "tip of the iceberg" is the only visible portion of a huge mass of ice). By hiding its large size, a Hidden Volume Order reduces the price movements caused by substantial changes in the supply or demand of a certain Product.

 Table 2-4: Execution Specifications of the Orders in the Trading Systems of Forward Electricity

 Markets



3 Participants in the Greek Forward Market

In this Chapter, we record all the stakeholders participating in the Forward Market in Greece along with the categorization of the Entities they represent and the respective registries kept by the Market Operator and the Transmission System Operator.

3.1 Entities

.The elementary programming unit bearing a Market Schedule in the context of the Greek Forward Market analyzed in this document is referred to as the Entity. The set of Entities includes all physical assets connected to the Transmission System or the Distribution System, as follows:

a) <u>Generating Unit</u>: Conventional Dispatchable Generating Unit with an installed capacity above 5 MW, which can follow Dispatch Instructions by the TSO. This category includes also the Dispatchable CHP Units above 35 MW, as referred in the Hellenic Transmission System Operation Code, and the Auto-Producer Conventional Units, namely the conventional dispatchable Generating Units of Auto-Producers (or Self-Suppliers).

Representative Participant: Producer

b) **Non-Dispatchable Load Portfolio**: Portfolio (aggregation) of individual loads which **cannot** follow Dispatch Instructions by the TSO.

Representative Participant: Load Representative

c) <u>Dispatchable Load Portfolio</u>: Portfolio (aggregation) of individual loads which **can** follow Dispatch Instructions by the TSO.

<u>Representative Participants:</u> <u>Load Representative for the energy supply and for</u> adjusting its demand based on economic signals (demand-response)

d) <u>**RES Unit</u>**: An individual RES Unit which directly participates in the wholesale electricity market. A RES Unit comes under one of the categories 1(b), 2, 3(b), 4, 5 or 6 presented in Annex C of the Detailed Design Report of the Day-Ahead Market.</u>

Representative Participant: RES Producer or RES Aggregator

e) <u>Dispatchable RES Portfolio</u>: Portfolio (aggregation) of RES Units of a specific RES category (e.g. wind plants, PV stations, etc.) located in a specific Bidding Zone, which participates in the wholesale electricity market and which (based on its technical capability) can follow Dispatch Instructions (on a portfolio basis) by the TSO. The RES units included in a Dispatchable RES Portfolio come under one of the categories 1(b) 2, 3(b), 4, 5 and 6 presented in Annex C of the Detailed Design Report of the Day-



Ahead Market.

Representative Participant: RES Aggregator, RES Producer³

f) <u>Non-Dispatchable</u> <u>RES Portfolio</u>: Portfolio (aggregation) of RES Units of the same RES category (e.g. wind plants, PV stations, etc.) located in a specific Bidding Zone, which participates in the wholesale electricity market, but which cannot follow Dispatch Instructions by the TSO. The RES Units included in a RES Portfolio come under one of the categories 1(b), 2, 3(b), 4, 5 and 6 presented in Annex C of the Detailed Design Report of the Day-Ahead Market.

Representative Participant: RES Aggregator, Last Resort Aggregator, RES Producer

g) <u>RES FiT Portfolio</u>: Portfolio (aggregation) of RES Units which shall not participate in the wholesale electricity market. The RES Units included in the RES FiT Portfolio come under one of the categories 1(a) or 3(a) (remuneration under a Feed-in-Tariff regime) presented in Annex C of the Detailed Design Report of the Day-Ahead Market.

Representative Participant: RES and CHP Units Registry Operator

h) <u>Generating Unit in Commissioning or Testing Operation</u>: Generating Unit that has declared to the TSO a specific energy production schedule for the Delivery Day, due to commissioning operation or testing operation.

Representative participant: Producer, Transmission System Operator⁴

i) **<u>RES Unit in Commissioning or Testing Operation</u>**: RES Unit that has declared to the TSO a specific energy production schedule for the Delivery Day, due to commissioning operation or testing operation.

Representative participant: RES Producer, Transmission System Operator⁵

We should note the following, regarding the Entities presented above:

1) The RES Aggregator referred in the above list can alternatively be the Last Resort Aggregator referred in the recent Greek Law 4414/2016 (concerning the new

⁵ In case of a RES Unit in Commissioning or Testing Operation, the Transmission System Operator is responsible for the submission of Priority Price-Taking Orders on behalf of the RES Producer in the Day-Ahead Market and in the Intra-Day Market.

³ A RES Producer can represent the RES Units registered in its Participant Account only, either on a unitbasis, or on portfolio-basis.

⁴ In case of a Generating Unit in Commissioning or Testing Operation, the Transmission System Operator is responsible for the submission of Priority Price-Taking Orders on behalf of the Producer in the Day-Ahead Market and in the Intra-Day Market.



remuneration scheme of RES units in Greece). For simplification purposes, in the remaining of this report we will use only the term RES Aggregator when referring to the representative of a RES Portfolio, without excluding the possibility for the representative to be the Last Resort Aggregator or a RES Producer.

- 2) An individual RES Unit can be also represented by a RES Aggregator (or the Last Resort Aggregator), but as a single Entity (being itself a RES Portfolio.
- 3) All the above-presented Participants except from the RES and CHP Units Registry Operator representing the RES FiT Portfolio, a Producer representing a Generating Unit in Commissioning or Testing Operation, and a RES Producer representing a RES Unit in Commissioning or Testing Operation can participate in the Forward Market.

3.2 Participants

The Participants representing one or more Entities are the following:

- a) Producers representing (on a unit basis) Generating Units (including Auto-Producer Conventional Units),
- b) Load Representatives representing Non-Dispatchable Load Portfolios and/or Dispatchable Load Portfolios,
- c) RES Producers representing Dispatchable and Non-Dispatchable RES Portfolios (i.e., a Portfolio of RES units of the same RES category located in a specific Bidding Zone),
- d) RES Aggregators representing Dispatchable and Non-Dispatchable RES Portfolios,
- e) the Last Resort Aggregator representing Dispatchable and Non-Dispatchable RES Portfolios,
- f) TSO representing RES Units in Commissioning or Testing Operation and Generating Units in Commissioning or Testing Operation, and
- g) RES and CHP Units Registry Operator representing the RES FiT Portfolio and High-Efficiency Cogeneration Dispatchable Unit.

3.3 Registries

For the scope of the Forward Market, Day-Ahead Market and Intra-Day Market operation, the Market Operator shall keep a Registry for all Participants.



In addition, the Transmission System Operator shall keep separate registries for the Generating Units, the Dispatchable Load Portfolios, the Non-Dispatchable Load Portfolios, the DR Portfolios, the Dispatchable RES Units and the Dispatchable RES Portfolios; the TSO shall pass to the Market Operator the necessary information of these registries, for the purposes of the herein described Forward Market operation.

The registries maintained by the TSO are presented in the detailed design of the Balancing Market.

Finally, the RES and CHP Units Registry Operator shall keep separate registries for the Dispatchable RES Units, the Non-Dispatchable RES Units, the Dispatchable RES Portfolio, the Non-Dispatchable RES Portfolio and the Dispatchable CHP Units. The RES and CHP Units Registry Operator shall pass to the Market Operator the necessary information of these registries, for the purposes of the herein described Forward Market operation.

3.4 Participation Requirements

Participation of a Participant in the Forward Market prerequisites:

- a) the existence of valid and duly signed Participation Agreement with the Market Operator;
- b) the existence of a valid and duly signed Financial Agreement either directly or indirectly (through a Clearing Member) with the Market Operator or the Clearing House; and
- c)the existence of a valid and duly signed Balancing Contract with the Transmission System Operator.

3.5 **Participation Rules**

First of all, it should be noted that participation in the Forward Market is optional for all Participants and the trading is carried out on a portfolio-basis. More specifically, Participants are allowed to conclude and register Forward Contracts in the Forward Market independently of their role and their physical assets.

Participation in the Forward Market shall mean in particular:

- a) the submission of Sell and Buy Orders and the conclusion of Forward Contracts at the Exchange Based Forward Market; and/or
- b) the registration of Bilateral OTC Contracts at the Nomination Platform.

Additional participation rules that shall be implemented in the framework of the Forward Market are the following:



- a) The Participant selling energy through Forward Contracts is called Delivering Participant, whereas the Participant buying energy is called Receiving Participant.
- b) Conclusion of Forward Contracts in the Forward Market is subject to physical delivery obligation. Participants are obliged to proceed with the Physical Settlement of their Net Deliver Position(s) on an asset basis. Physical Settlement of Net Delivery Position(s) is executed in the Day-Ahead Market.
- c) In case of bilateral trading, all Forward Contract Specifications included in a Bilateral OTC Contract are at the sole discretion of the Delivering Participant and the Receiving Participant, apart from those affected by power mitigation rules, as decided by the Regulator or the Position, Pre-Trade and Pre-Clearing Limits set by the Market Operator.
- d) The energy quantities sold under a Forward Contract are deemed to be delivered at the Meter Point.
- e) The energy quantities bought under a Forward Contract are deemed to be delivered at the Transmission-Distribution Boundary.

3.6 Participation Fees

In this Section the fee structure for all Markets (Forward, Day-Ahead & Intra-Day) is presented. No numerical values are proposed. A feasibility study should support any fee proposal since such a proposal is expected to have a significant impact on the viability of the Market Operator and on the competitiveness of the Market. The structure and level of fees require approval from the RAE. According to law 4425/20116, art. 11, the Market Operator must submit to RAE for approval and certification the entity responsible for Clearing and Settlement under a set of criteria and particularly its fees structures.

The Participants shall pay fees for the Trading Services provided by the Market Operator.

The overall fees shall consist of the following components:

- Annual Fee, separately for each market (Forward, Day-Ahead and Intra-Day Market). The Annual Fee represents the cost of trading services for the participation in the markets and it shall be a fixed amount per year;
- B) <u>Membership Fee</u>, separately for the Forward Market and for the spot market (Day-Ahead and Intra-Day Markets); and the
- C) <u>**Transactions Fee**</u>, for each MWh traded (both bought and sold) by each Participant.

The Membership Fee constitutes a one-off payment to all newly-admitted Participants. The Membership Fee shall be due on the Participation Commencement Day.

The Annual Fee in the first year shall be due on the Participation Commencement Day. The annual fee for every subsequent year Y shall be due five (5) Working Days before the



start of the calendar year Y. No refund shall be given by the Market Operator to the Participant in case of termination during a year.

The Transactions Fee shall be charged to the Participants for the execution of Orders. Thus, transaction fees depend on the executed volume in Megawatt hours (MWh). The Transactions Fee shall be due in the 5th Working Day of calendar month M+1 for the energy transactions concluded in calendar month M.

The fees shall be collected directly by the Market Operator, following the issuance of a respective invoice to each Participant.

The values of the above fees (Membership Fee, Annual Fee and Transactions Fee) shall be established for each calendar year by a decision by the Regulator following a proposal of the Market Operator.



4 Exchange-Based Forward Market

4.1 Introduction

As clearly established above, within the scope of the Target Model and in the frame of the growing integration of the European electricity markets, the set-up for the Greek electricity market shall consist of the Spot (Day-Ahead, Intra-Day) and Balancing Markets (which will be thoroughly presented and analyzed in the following reports of this project), complemented with a medium/long-term Forward Market.

This *Chapter* analyzes the design architecture and special features of the Greek Exchange-Based Forward Market. Price hedging based on Exchange-Based Forward Contracts in the Exchange-Based Forward Market administered by the Market Operator, combined with the physical procurement of power (Physical Settlement) at the national Spot Market, (also administered by the Market Operator) will serve as a key tool in Risk Management, since it will partially disengage Participants from the volatility of the Spot Market price, allowing them to rely on prices according to their own estimations.

This report describes the development of a liquid and transparent Exchange-Based Forward Market in Greece with obligation of Physical Delivery, according to Law 4425/2016. The target is the optimal design of an applicable market scheme, which will provide a reliable reference signal to the Participants, while taking into consideration the special characteristics of the Greek market.

Given the extensive analysis and the development of a sound market framework provided in the previous *Chapters*, the design architecture described in this *Chapter* will follow effortlessly and will result in an easy to understand and comprehensive market system.

The herein described market architecture constitute a comprehensive market design which is consistent with EU regulations and specifically adjusted for the well-functioning of the market under development. Further, it draws upon our detailed analysis of the following similar EU markets, EEX, NASDAQ, PXE, GME and TURKDEX.

In summary, we believe that the overall **benefits for the Greek electricity market**, upon the introduction and implementation of the herein described Exchange-Based Forward Market, are:

- Exchange-Based Forward Contracts shall address the price risk by enabling Participants to lock in prices and quantities, thus limiting the exposure to the more volatile Spot Market.
- An Exchange-Based Forward Market shall deter market power abuse by providing a substitutional choice of forward contracting, when the Day-Ahead Market clearing



price is susceptible to strategic behavior; thus, prices shall stabilize and evolve over time with reduced market distortions.

Forward contracting shall enhance the Greek market's compatibility with longerrange activities, such as system planning for generation, transmission, distribution and Demand Response investments, by indicating long-term future expectations of hourly market prices.

In the following Sections of this Chapter, we present the trading procedures of the Exchange-Based Forward Market. Detailed timelines of the way the Exchange-Based Forward Market operates along with a detailed description of the Exchange-Based Forward Products is also included.

4.2 Energy Trading System

The Market Operator shall operate an Energy Trading System, which comprises of a Trading Platform, a Nomination Platform and a Clearing Platform depending on the selection of the Clearing House.

Trading shall take place through the Trading Platform which is the electronic trading system used for trading at the Power Exchange. Participants shall submit Orders from their respective workstations to the Trading Platform, by electronic means. In this context, the Trading Platform shall be used for receiving, validating and matching of Orders.

The Nomination Platform shall be used for the Forward Contracts Registration and the submission of Physical Delivery Nominations and Physical Offtake Nominations by the Clearing House and the Participants, which shall be submitted to the Day-Ahead Market with Priority Price-Taking Orders as detailed in the Day-Ahead Market Code.

The Market Operator shall grant access to the Energy Trading System if the following requirements are satisfied:

- the Registered Participant has fulfilled the requirements on authentication as set forth by the Energy Trading System Rules published by the Market Operator; such requirements may include but are not limited to the obligation to provide an electronic certificate for signing and encryption or other technology for authentication purposes; and
- 2) the identified person(s) of the Registered Participant, called Exchange Traders, for which the user account(s) in the Energy Trading System shall be established, has(ve) passed successfully the qualifications test imposed by the Market Operator on the correct use of the Energy Trading System.

The Market Operator shall confirm the creation of the user account(s) or send a refusal note to the Registered Participant, at the latest, five (5) Working Days after the completion



of the qualifications test by the identified person(s) of the Registered Participant. The confirmation or refusal note shall be sent via email to the operational contact person specified by the Registered Participant. The Market Operator shall send the duly justified refusal note if the requirements listed above are not fulfilled and access to the Energy Trading System will not be granted.

4.3 Trading Days and Periods

Trading on the Exchange-Based Forward Market shall take place on days specified in the Trading Calendar⁶. Two (2) months before the end of each year, the Market Operator issues a Trading Calendar for the coming year and posts it on its website. Modifications to this Trading Calendar may take place, in case of unscheduled public holidays at a national and/or European level.

The Exchange-Based Forward Market Trading Periods for trading shall be from 10:30 EET to 15:30 EET in every Trading Day.

The Forward Products of the Exchange-Based Forward Market will be traded in Continuous Trading, i.e. trades are concluded on the basis of continuous matching of Buy and Sell Orders. Participants are provided with information on a continuous basis regarding the current status of the market, namely the current price (price of last trade), the best Buy and the best Sell Orders (bid and ask) and the market depth. The information thus provided is updated immediately after each change under Continuous Trading, in particular after each Order is entered, cancelled or changed.

The Trading Platform shall not validate any Orders after the end of the Forward Market Trading Periods (15:30 EET). The Market Operator shall be able to extend or reduce the Trading Periods on any given Trading Day to the extent necessary, to maintain orderly trading conditions, or for reasons relating to the ETS. Transactions shall be published in real-time and all trading and clearing activity shall be performed anonymously.

4.4 Products

4.4.1 **Product Description**

The Exchange-Based Forward Contract in the Greek Exchange-Based Forward Market shall be a standardized physically settled contract, with injection and withdrawal obligation, referring to the delivery of electricity in future Delivery Periods. The contract will be financially settled based on the average Day-Ahead Market prices of future Delivery Periods.

⁶ It should be noted that this refers exclusively for the Trading Days and Trading Periods of the Exchange-Based Forward Market, not the operation of the Nomination Platform. The latter shall operate normally throughout the year (365 days).



In this sub-section we include a detailed product specification description (e.g. standard symbols for Delivery Periods and Load Profile, forward abbreviations, rules of admission of new products into the forward market, etc.)

Each Forward Product shall have its own ID, which shall be formulated in such way as to contain at least the following information:

- a) the traded commodity (e.g. "E" for electricity, "G" for gas, etc.)
- b) the Load Profile (baseload, peak-load); and
- c) the Delivery Period.

For example:

a) the yearly baseload product for year 2018 can have an ID as follows:

GR_E_BL_Y01-18

b) the quarterly peak-load product for Q3 2018 can have an ID as follows:

GR_E_PL_Q03-18

c) whereas the monthly baseload product for August 2018 can have an ID as follows:

GR_E_BL_M08-18

The admission process for new Exchange-Based Forward Products shall be administered as follows.

Based on the market conditions and the interest of the Participants in hedging their risks, the Market Operator shall periodically consult with the Participants and the Clearing House and shall design and introduce in the Exchange-Based Forward Market new Forward Products with full technical specifications and a justification of the needs covered by such Forward Products. The Market Operator shall then send the justified proposal to the Regulator for approval. Such approval must be provided at least two (2) months prior to the trading commencement date of the new Forward Products.

The Market Operator shall monitor the liquidity of all tradable Forward Products, and shall issue a report every three (3) calendar months, which shall be notified to the Regulator and published in the Market Operator's website. In case a Forward Product has zero or even minor liquidity, the Market Operator shall consult with the Regulator and the Clearing House in order to investigate low liquidity and take all necessary measures.

4.4.2 Load Profile



Forward Contracts with the following Load Profiles shall be traded:

- Baseload Forward Contracts
- Peak-load Forward Contracts⁷

4.4.3 Delivery Day and Periods

The Delivery Day comprises of twenty-four (24) Delivery Hours, starting at 01:00 EET on a calendar day and ending at 01:00 EET on the same calendar day.

On the short-clock change day in March (beginning of summer savings time), the Delivery Day comprises of twenty- three (23) Delivery Hours while on the long-clock change day in October (end of summer savings time), the Delivery Day comprises twenty-five (25) Delivery Hours.

The following tradable Forward Products with the below-mentioned Delivery Period shall be available in the Exchange-Based Forward Market:

- <u>Standard Month Contracts</u>: During month *m*, the Standard Month Contracts for the following calendar months *m*+*x* shall be traded. The current delivery month shall not be tradable.
- <u>Standard Quarter Contracts</u>: During quarter q, the Standard Quarter Contracts for the following full calendar quarters q+x shall be traded.
- <u>Standard Year Contracts</u>: During calendar year *y*, the Standard Year Contracts for the following full calendar years *y*+*x* shall be traded.

The tradable Forward Products shall be recommended for each calendar year by the Market Operator and approved by the Regulator. Any modifications to the number of tradable Forward Products are subject to a regulatory decision. Additionally, the detailed Forward Contract Specifications of Forward Products are determined by the Market Operator, approved by the Regulator and published at the website of the Market Operator at least two (2) months prior to their trading commencement date.

Day, weekend and week contracts, which shall close the gap between day-ahead trading in the Spot Market and the Standard Month Contracts in the Exchange-Based Forward Market, can also be considered at a later stage, when sufficient experience has been gained and enough liquidity in the Exchange-Based Forward Market has been attained.

4.4.4 Expiry Days

⁷ Off-peak load products can also be considered at a later stage, when sufficient experience has been gained and enough liquidity in the Forward Market has been attained.



The Expiry Day (last day of trading) for the Standard Year Contracts, the Standard Quarter Contracts and the Standard Month Contracts shall be accordingly:

- <u>Standard Year Contracts</u>: Three (3) Trading Days before the beginning of the Delivery Period (on that day, Cascading for Standard Year Contracts shall be effected).
- <u>Standard Quarter Contracts</u>: Three (3) Trading Days before the beginning of the Delivery Period (on that day, Cascading for Standard Quarter Contracts shall be effected).
- <u>Standard Month Contracts</u>: Two (2) Trading Days before the beginning of the Delivery Period.

4.4.5 Cascading Mechanism

Standard Year and Standard Quarter Forward Contracts shall be further split through the Cascading Mechanism. The Cascading Mechanism shall be performed by the Clearing House.

- **Standard Year Contracts** shall cascade into corresponding Standard Quarter Contracts, spanning the same Delivery Period as the Standard Year Contract, on the Expiry Day (three Trading Days before the beginning of the Delivery Period).
- **Standard Quarter Contracts** shall cascade into corresponding Standard Month Contracts, spanning the same Delivery Period as the Standard Quarter Contract, on the Expiry Day (three Trading Days before the beginning of the Delivery Period).
- **Standard Month Contracts** shall not be subject to any further splitting.

The price of the cascaded contracts shall equal the Final Settlement Price of the original contract on its Expiry Day (Cascading Day).

The Open Positions of the Participants after cascading shall be calculated by the Clearing House, and will be assigned to their holders accordingly. The positions assigned shall take part in the clearing procedure subject to the provisions of the Clearing Rules of the Clearing House.

4.4.6 Trading Gate Opening Time

This *Section* focuses on the Trading Gate Opening Time of the Standard Year, Quarter and Month Contracts, which have been described in the *Section 4.4.3*.

More specifically, *Figure 4-1* illustrates the Trading Gate Opening Time for the Standard **Month Contract**. <u>That is, six (6) months before the Expiry Day of the Forward</u>



Contract (which is two Trading Days before the beginning of the Delivery Period).

The Figure also illustrates the day of the establishment of the Final Settlement Price of the Standard Month Contract, which shall be the Weighted Average Zonal Day-Ahead Market Clearing Price, weighted by the sum of the accepted Buy Orders of the internal Bidding Zones, for each Delivery Hour of the Delivery Month and Load Profile. It finally illustrates the day of the financial fulfillment, when all remaining Open Positions in the Standard Month Contract are ultimately closed out.

1st D is referred to the first Delivery Day of the Delivery Period, while Last D is referred to the last Delivery Day of the Delivery Period.



Figure 4-1: Trading Gate Opening Time and Expiry Day for the Standard Month Contract

Figure 4-2 illustrates the Trading Gate Opening Time to be implemented for the **Standard Quarter Contract**. <u>That is, four (4) quarters before the Expiry Day of the Standard</u> <u>Quarter Contract</u>.

On the Expiry Day (three Trading Days before the beginning of the Delivery Period) Cascading of the Standard Quarter Contract into the corresponding three Standard Month Contracts shall take place. Afterwards, the Trading Gate Opening Time and the Expiry Day of each cascaded Standard Month Contract shall be applied, as illustrated in the previous *Figure 4-1*.

Again, 1st D is referred to the first Delivery Day of the Delivery Period, while Last D is referred to the last Delivery Day of the Delivery Period.





Figure 4-2: Trading Gate Opening Time and Expiry Day for the Standard Quarter Contract

Finally, Figure 4-3 illustrates the Trading Gate Opening Time which will be implemented for the Standard Year Contract. <u>That is, one (1) year before the Expiry Day of the Standard Year Contract.</u>

On the Expiry Day (three Trading Days before the beginning of the Delivery Period) Cascading of the Standard Year Contract into the corresponding three Standard Month Contracts (January, February, March) and Standard Quarter Contracts Q2, Q3, Q4 shall take place.

Afterwards, the Trading Gate Opening Time and Expiry Day of each cascaded Standard Month and Standard Quarter Contract shall be applied, as per the previous *Figures 4-1 and 4-2*.





Figure 4-3: Trading Gate Opening Time and Expiry Day for the Standard Year Contract

4.5 Orders

4.5.1 Order Types

Participants may, within the Trading Periods on any Trading Day, submit Orders and enter into transactions through the Trading Platform of the Market Operator.

It should be that all Participants are allowed to submit and conclude Sell and Buy Orders to the Exchange-Based Forward Market, independently of their role and their physical assets. The same is valid for Bilateral OTC Contracts. This capability / flexibility does not mean that the Regulator shall simplify all licenses to one single license, since certain roles of Participants (e.g. Producers, RES Producers) have more obligations (i.e. submission of Non-Availability Declarations) with respect to other roles (e.g. Load Representatives). Furthermore, the rights and obligations are completely different in the Balancing Market compared to the other Markets as presented in detail in the respective report.



The types of Orders included in *Table 4-1* shall be used in the Greek Exchange-Based Forward Market providing several possibilities to the Participants to efficiently handle the bidding risks and unfold their bidding strategies.

Orders in the Exchange-Based Forward Market				
Market Order	This Order is entered without a price, thus it cannot be stored in the central Order Book. This Order shall be matched immediately at the best available price. If not fully executed the remainder will be inserted in the Order Book as a Limit Order, with a price equal to the price of the last trade.			
	This Order shall be matched at the Order price or better, for as much of the Order volume as possible.			
Limit Order	Limit Orders can be entered with the time specifications Good-For-Day (GFD), Good-Till-Cancelled (GTC) and Good-Till-Date (GTD). Limit Orders entered without the time specifications GTC or GTD shall be valid only until the end of the given Trading Day (naturally GFD Orders).			
	Limit Orders can also be submitted with the execution specifications Immediate-or-Cancel (IOC), Fill-or-Kill (FOK) and All-or-None (AON)			
	This Order shall be an Order where a combination of two single Orders is made. When a transaction takes place in one of the single Orders (called "legs" here), the volume of the other Order (leg) is immediately reduced proportionally, so there will be no risk of double-trading.			
Linked Order	Linked Orders shall be entered into a separate Order Book and they shall be executed against other Linked Orders of this separate Order Book, or against individual (single) Orders in the regular Order Book.			
	Linked Orders can be entered with the time specifications GTC or GTD, if not they are by default GFD.			
	Linked Orders can be submitted with the execution specifications IOC, FOK and AON.			
Iceberg Order	This Order includes an executable quantity that is only partially visible to the market, leaving a hidden quantity divided into smaller parts "below the surface". The total volume of the Order is divided into smaller parts, with only one part being displayed in the Order Book. Both the displayed (visible) and non-displayed (hidden) parts of the Order are available for potential execution against incoming Orders. The displayed part is automatically refreshed from a non-displayed part, once the displayed part is fully executed. Refreshing the displayed part is regarded as a new Order from a "time priority" point of view.			
	Iceberg Orders in the Forward Market shall have a minimum visible volume requirement			



equal to 5 MW for year, quarter and month Forward Contracts.

Iceberg Orders can be entered with the time specifications Good-till-Cancelled (GTC) and Good-till-Date (GTD). Iceberg Orders entered without the time specifications GTC or GTD shall be valid only until the end of the given Trading Day (naturally Good-for-Day (GFD) Orders).

Table 4-1: Orders in the Exchange-Based Forward Market

4.5.2 Execution and Time Specifications

The minimum contents of an Order submitted to the Trading Platform by a Participant shall be the following:

- Participant EIC Code;
- Product identification;
- Buy Order or Sell Order (if the contract is to be bought or sold respectively);
- Order Volume (number of contracts);
- Order Type and possible execution and time specifications for the Order;
- Order Price (unless the Order is a Market Order); and
- If applicable: any additional information as mandated by the Energy Trading System Rules or the prevailing functionality of the Trading Platform.

The Order prices are submitted in \in /MWh. The lot size of the Order is in 1 MW per Forward Contract. It should be noted that, the Orders' prices must be within a specific administratively defined range within the Base Price (Daily Settlement Price of the previous Trading Day) plus or minus X%. Orders with a price not within the price limits set on a daily basis shall be automatically rejected by the Trading Platform. The value of X% shall be established by a relevant suggestion of the Market Operator which shall be approved by the Regulator. Such decision shall be taken at least two (2) months prior to enforcement.

Finally, the tick size is equal to 0.01 €/MWh (with two decimal digits); this corresponds to a minimum price fluctuation of 0.01 points per MWh multiplied by the contract volume in each case.

The contract volume is calculated as follows:

Contact Volume (MWh): "Lot Size x Delivery Days x Delivery Hours/Day".



The Contract Volume varies depending on the number of days in each Delivery Period and summer/winter time.

Example using Standard Month Forward Contracts:

The contract volume for 28 day delivery months is 672 MWh (1x28x24 MWh).

The contract volume for 29 day delivery month of February is 696 MWh (1x29x24 MWh).

The contract volume for 30 day delivery months is 720 MWh (1x30x24 MWh).

The contract volume for 31 day delivery months is 744 MWh (1x31x24 MWh).

The contract volume for all the Products ranges from 240 MWh for the smallest peakload Standard Month Contract to 8,784 MWh for the biggest baseload Standard Year Contract (in case of leap years).

It should be noted that on changes to or from daylight savings time affected contracts shall be one hour shorter or longer than normal. That is, for the day of transition from winter time to summer time, the number of Delivery Hours shall be applied as 23. For the day of transition from daylight saving time to winter time, the number of Delivery Hours shall be applied as 25.

Orders can be submitted with the following execution and time specifications:

- A) Good-For-Day (GFD): A GFD is valid for the specific Trading Day on which it was submitted. Unless it is partly or entirely fulfilled by the end of this Trading Day, it will be automatically cancelled by the Trading Platform.
- B) Good-till-Cancelled (GTC): A GTC is valid until it is cancelled by a specific cancelling Order. Unless previously cancelled or matched, GTC Orders remain valid until the end of the Expiry Day of the Forward Contract, when they are automatically cancelled.
- C) Good-till-Date (GTD): A GTD is valid until a date specified in the Order. Unless cancelled or matched by the specified date, GTD Orders remain valid until the specified date and are automatically cancelled by the Trading Platform at the end of that date. The Trading Platform does not accept Orders with dates further than the Expiry Day.
- D) Immediate-or-Cancel (IOC) or Fill-and-Kill (FAK): IOC Orders are executed immediately upon entry into the Trading Platform, to the extent possible depending on the opposite Orders waiting in the Order Book, with the unexecuted part cancelled. Unlike FOK Orders, IOC Orders allow for partial fills. No IOC Orders are stored in the Order Book during continuous matching.



- E) Fill-or-Kill (FOK): FOK Orders are executed immediately upon entry into the Trading Platform, in full, or cancelled all together. Unlike IOC Orders, FOK Orders require the full quantity to be executed. No FOK Orders are stored in the Order Book during continuous matching.
- F) All-or-None (AON): AON Orders are executed in their entirety, or not executed at all. Partial execution is not acceptable. AON Orders are similar to FOK Orders, but the former focuses on "complete vs. partial fulfilment", whereas the latter hinges on the immediacy of the transaction.
- G) Stop Order: This Order shall be an Order that is submitted automatically as a Market Order or Limit Order once a certain price condition of the Forward Contract is met.

The Participants shall specify a price ("stop limit") when submitting the Stop Order into the Trading Platform. If, during the course of trading in the respective Forward Contract, the "stop limit" is reached or exceeded, the Stop Order shall be converted into a Market Order or a Limit Order.

The Stop Order shall be active (in case the price of the stop condition is within the range of the upper/lower price limits of the current trading day) but it shall not be visible to the market before it is converted to a Market Order.

Stop Orders shall be entered into a separate Order Book. Stop Orders can be entered with the time specifications Good-till-Cancelled (GTC) and Good-till-Date (GTD). Stop Orders entered without the time specifications GTC or GTD shall be valid only until the end of the given Trading Day (naturally Good-for-Day (GFD) Orders).

A Stop Order in the Forward Market shall be one of the following types:

- 1) <u>Regular Stop Order</u>: According to the "buy high sell low" principle, a Buy Order is submitted to the market as a Market Order when the price for a Product rises to a specified level ("stop limit") and a Sell Order is submitted to the market as a Market Order when the price falls to a specified level ("stop limit"). "). The purpose of a Regular Stop Order is to cut the loss of an existing position no matter where the price is, hence the Market Order component. For example if a Trader has bought a Forward at 30€ and has placed a Regular Stop Order with a stop limit at 25€, when the price of the last trade in the market drops to the stop limit (25€), a Sell Market Order will be automatically sent into the market.
- 2) <u>Stop Limit Order:</u> A Stop Limit Order combines the features of a Regular Stop Order and a Limit Order. It lists two prices (the "stop limit" and the "price limit") and is an attempt to gain more control over the price at which the stop is filled. Once the "stop limit" is reached, the Stop Limit Order becomes a Limit Order



to buy (or to sell) at no more (or less) than another, pre-specified "price limit". The purpose of a Stop Limit Order is to cut the loss of an existing position but not at any price, hence the Limit Order component. For example if a Trader has bought a Forward at $30 \in$ and has placed a Stop Limit Order with a stop limit at $25 \in$ and a price limit at $26 \in$, when the price of the last trade in the market drops to the stop limit ($25 \in$), a Sell Limit Order with a price of $26 \in$ will be automatically sent into the market.

3) <u>Market if Touched Stop Order (MIT):</u> MITs are the opposite of Regular Stop Orders. According to the "buy low - sell high" principle, a Sell Order is submitted to the market as a Market Order when the price for a Product rises to a specified level ("stop limit") and a Buy Order is submitted to the market as a Market Order when the price falls to a specified level ("stop limit"). The purpose of a Market if Touched Stop Order, is to open a position when the asset reaches a predefined price level. For example let's assume a Forward trades at 30€ and a Trader wants to open a Short Position if it rises to 35€. He then enters a Sell Market if Touched Stop Order with a stop limit of 35€. When the price of the last trade in the market rises to the stop limit (35€), a Sell Market Order will be automatically sent into the market

4.5.3 Execution of Orders

Orders shall be executed in full or partially, in one or more steps according to their execution and time specifications.

An Order shall be generally valid from the time of registration in the Trading Platform until it is matched, canceled, amended, or has expired pursuant to its individual execution and time specifications.

Amendments to registered Orders which affect the Order price or which increase the Order volume, shall be considered to be a new Order (the original Order is canceled), with the consequence that the new Order will be given a new chronological rank in the Order Book.

Amendments to a registered Order with respect to a decrease in volume shall be deemed an adjustment of the registered Order and shall not affect ranking.

4.5.4 Matching of Orders

The main rule for ranking of Orders is based firstly upon best price ("price priority") and secondly by the longest storage time ("time priority"). That is, during Continuous Trading, prices shall be determined by matching Orders at the best possible Buy and Sell Order prices, while the priority order in the same price level shall be the time when the Order was inserted in the Trading Platform. More specifically:



- Buy Orders and Sell Orders entered with the same price shall match into a transaction.
- **Buy Orders** entered into the Order Book with a higher price than the Sell Order with the lowest price ("crossing prices"), shall match into one or more transactions depending on the volume of the incoming Order and the volume and the price of the Sell Orders. The matching process shall try to fill as much as possible of the volume in the incoming Buy Order, until the limit of the "crossing prices" is passed.
- Sell Orders entered into the Order Book with a lower price than the Buy Order with the highest price ("crossing prices"), shall match into one or more transactions depending on the volume of the incoming Order and the volume and the price of the Buy Orders. The matching process shall try to fill as much as possible of the volume in the incoming Sell Order, until the limit of the "crossing prices" is passed.
- Market Orders are given priority at all times.
- Each new incoming Order is immediately checked for execution against Orders on the opposite side of the Order Book.
- Opposite Orders of the same Participant cannot be matched.

We assume that there is no brokerage, neither possibility to trade for another "client". RES Aggregators submit one offer for their whole portfolio (per RES category).

The following example clarifies the conclusion of two simple forward transactions in the Trading Platform of the Market Operator:

Example 4.1: Conclusion of a transaction in the Trading Platform

Figure 4-4 illustrates a simple example of the conclusion of two forward transactions at 11:01 (EET) during a Trading Day, in the Exchange-Based Forward Market.

As previously analyzed, Buy Orders and Sell Orders are ranked firstly by "price priority". When the prices are identical, Buy Orders and Sell Orders are ranked in the chronological order in which they were entered into the Trading Platform (see, for instance, the 1st and the 2nd Buy Order in the Order Book before the conclusion of the transaction in Figure 4-4).





Figure 4-4: Conclusion of a Transaction in the Trading Platform

At 11:01 (EET), a Limit Sell Order (Offer) of 12 MW for 37 \in /MWh is submitted into the Trading Platform, and is immediately matched into two transactions (without previously being entered into the Order Book). The first 10 MW of the Sell Order are matched with the 10 MW of the Best Buy Order at 11:01, at a price of 37 \in /MWh. The remaining 2 MW of the Sell Order are matched with 2 MW of the 5 MW of the 2nd Buy Order (which was ranked 2nd due to the "time priority" rule), again at a price of 37 \in /MWh. After the conclusion of these transactions the Order Book is adjusted as shown in the Figure 4-4.

4.5.5 Cancellation of Trades and Orders

The Market Operator may cancel a trade upon Participants' request, under the following conditions:

A) the Market Operator receives a request from a Participant participating in the relevant trade not later than ten (10) minutes after the trade is concluded;



- B) the Market Operator sends a Cancelation Confirmation Request to the counterparty of the Participant who has requested the cancellation no later than ten (10) minutes after the relevant request ;
- C) the counterparty of the trade may grand its consent no later than thirty (30) minutes from the conclusion of the trade.

After the trade cancelation is confirmed each Participant's position will be automatically updated accordingly. The canceled trade will not be considered during the Clearing process. The Participant requested the cancellation shall be charged a one-off fee by the Market Operator.

The Market Operator may not cancel a transaction, even if the conditions in the previous paragraph apply or the Market Operator may proceed with obligatory cancellation of Orders and/or trades for the purpose of safeguarding the smooth operation of the Forward Market.

4.5.6 Objections against Trades

Objections against a transaction which has been concluded shall only be asserted with reference to errors in the corresponding Trading Platform of the Market Operator or to bad mistakes which can be recognized objectively during entering of volumes or prices. The objections shall be raised towards the Market Operator in writing or in text form forthwith. By means of raising said objection, the cancelation of the trade by the Market Operator is requested. The expenses incurred by the Market Operator on account of the cancelation and reversed transaction shall be refunded by the Participant requesting the cancelation, unless such cancelation is entirely based on an error within the corresponding Trading Platform.

4.6 **Pre Agreed Trades**

In this Section we present the trading method for Pre-Agreed trades including trade affirmation and validation rules. It should be noted that pre-agreed trades refer to trades on Exchange-Based products, which will appear on the ticker of the Trading Platform for information purposes, but which will not be concluded in the Trading Platform via placing relative Orders, but will be registered in the Trading Platform as a concluded Trade (only for the purposes of reporting, including the trade in statistics, and affirmation).

The only type of Agreed Price trading permitted under this method is between two different Participants.

4.6.1 **Pre-Agreed Trading Procedure**

Pre-Agreed trading method refers to the execution of trades on Exchange-Based products



that have been pre-agreed between two Participants with a bilaterally agreed price . The process is as follows:

The selling Participant nominates the trade in the Trading Platform. The buy side fields are left blank. After the trade has been entered, a message is sent to the buying Participant informing him that a trade was entered on his behalf, identified by the trade number. The trade status is set to "DC", "Depends on Contra member action".

ETS then sends the trade details to the buying member, who must then recall the trade using the trade number and either approve or disapprove the trade. If the buyer disapproves the trade, the seller is notified and the trade does not proceed any further. If the buyer disapproves, the trade status is set to "CD"; "Contra member has disapproved the trade".

4.6.2 Trade Affirmation by Market Official

The Market Operator should determine whether or not Agreed Prices of Pre-Agreed trades require approval prior to being reported as completed Trades. If approval is required then agreed price and cross trades are routed to the market official for approval before they are finalized.

Cross trades requiring approval are immediately sent to a dedicated user of the Market Operator (called "market regulation user"). Pre-Agreed trades are sent to market regulation user, only after the buyer trader has approved the trade input. After the trade has been sent to market regulation user for approval trade status is set to "DS", "Depends on Stock Exchange action".

A market regulation user must then recall the trade to the screen and either approve the trade or disapprove the trade. A workstation function should allow the market regulation user to review the details, and then mark the trade approved or disapproved.

If the buyer approves the trade, but the market regulation official disapproves it, then both the buyer and seller are informed of the disapproval and the trade does not proceed any further. The process stops at this point and the trade status is set to "ED", "Exchange has disapproved of trade".

If the market regulation user approves, the trade status is set to blank signifying that it is now an approved trade.

Market officials have the ability to approve any time up until the Market Runoff.



4.6.3 Rules for Validation and Approval of Pre-Agreed trades

The Market Operator should contain a price validation table to determine whether or not an Agreed Price for a Pre-Agreed trade is accepted by the system. This determination should be based on the price deviation percentage from the previous traded price (Main board of the security). The price validation is done based on the price that exists at the time the sellers enters the trade. The same table should be used to determine whether MO's approval is required for the trade.

Pre-Agreed trades outside the allowed price deviation percent, of the value range and currency of the trade should be rejected by the HPX ETS system.

4.7 Market Making Function

ECCO has analyzed the Market Making function in the context of the Greek market design and has recommended that such function is not recommended at the present time. The ECCO analysis has been released in a separate document. As such, Market Makers do not need to be certified at the present time.

4.8 Clearing House and Limits for Forward Contracts

4.8.1 Main tasks and responsibilities

A Clearing House provides Clearing and Settlement services related to cash transactions resulting from Variation Margin payments for the Forward Contracts. The Clearing House shall place itself between the counterparties, becoming the buyer for every seller and the seller for every buyer, thus, ensuring the fulfillment of transactions concluded on the Forward Market for which it provides Clearing. The Clearing House shall also be responsible for the securities to be provided by the Participants, so that they continue to participate in the Forward Market and conclude trades.

The Clearing House accedes to all transactions as the central contractual partner (central counterparty) and, hence, assumes the counterparty risk. In this context, the Participants settle their transactions with the Clearing House, thus they have to deposit securities with the Clearing House for liabilities entered into, due to these transactions. This structure safeguards the fulfillment of all transactions.

Whenever a forward Position is opened, a Participant has to deposit a basic margin, namely the Additional Margin, with the Clearing House. On many Forward Markets this margin is also referred to as the "initial margin". <u>It covers the risk of the maximum costs incurred for closing out all Open Positions of a Participant on the next Trading Day, subject to the assumption of the most unfavorable development of prices</u>



(potential loss in a worst-case scenario). The Additional Margin can also be fixed for the entire term of the Forward Contract. The Clearing House establishes the amount of the Additional Margin.

For example, on Trading Day D, a generating company (Producer) sells 25 MW of the baseload Standard Month Forward Contract for May 2013, at the price of EUR 30 per MWh. The operation of the Forward Market has calculated, using historical prices, that the forward value will not exceed EUR 32 per MWh the next Trading Day (D+1), with 99% certainty. Therefore, the Additional Margin requirement is set at 25 MW x 24 h/d x 31 d x EUR (32 - 30) per MWh = EUR 37,200. Thus the generating company has to post at least EUR 37,200 in its margin account as collateral.

The calculation of the Margin Requirements is not as simplistic as indicated above. It follows complicated rules according to the applied risk management procedures (e.g. cross-margining rules) of the Clearing House. The analytical formulas for the calculation of the Margin Requirements are described in the "margining rules handbook" of the Clearing House.

Details on the procedures implemented by the Clearing House and the interface between the trading and the clearing processes are provided in the following Sections.

4.8.2 Trading and Clearing Limits

Trading and Clearing Limits constitute a cornerstone for securing the functionality and integrity of commodity wholesale markets. These are several types of Trading and Clearing Limits, as detailed below.

4.8.2.1 **Position Limits**

The Market Operator shall set Position Limits for forward trading in order to ensure that trading proceeds in an orderly fashion, based on respective Regulatory decision(s). A Position Limit is a maximum number of Forward Contracts for each Forward Product that may be held (purchased and sold) by one Participant.

A Participant may not engage in any transactions on the Forward Market if there are any indications that the Participant, as a consequence of such transaction, whether alone or jointly with others, would hold or control a total Position in excess of the Position Limits set by the Market Operator. The Market Operator may modify Position Limits in order to maintain orderly trading and minimize undue influence of large Participants, based on Regulatory-defined criteria. Changes to Position Limits become effective no earlier than the sixth Trading Day following the date of their announcement. The Market Surveillance Department of the Market Operator monitors all Positions of the Participants, in order to ensure compliance with Position Limits.



4.8.2.2 **Pre-trade Limits**

A Pre-Trade Limit is the possibility of limiting Orders, which can be entered in the Trading Platform by a Participant, before conclusion of the trade.

The Clearing House can conclude special agreements with its Clearing Members, with regard to the Settlement of transactions on the markets and assign Pre-Trade Limits to its Clearing Members. It is entitled to impose technically supported Order Limits and to decide on the consequences in case of a non-compliance with these limits. The relevant procedures which will be built in the electronic platform of the Clearing House will support the temporary exclusion from trading, the temporary inadmissibility or technically supported inadmissibility of entering further orders (Trading Halt), the limitation of the frequency with which Orders can be entered for each Forward Product and the deletion of Orders which have already been entered.

Clearing Members which provide Financial Settlement for Participants, who are Non-Clearing Members, assign in turn Pre-Trade Limits to their Non-Clearing Members. Depending on the respective limit, the Clearing Members can store the Pre-Trade Limits agreed on with their Non-Clearing Members in the electronic system of the Clearing House (which are subsequently transferred to the Trading Platform of the Market Operator).

Pre-trade Limits can be also set to the electronic system of the Clearing House by the Participants themselves, in order to proactively manage their risk exposure. In case such Pre-Trade Limits entered by a Participant are more restricting than the respective limits enforced by its Clearing Member, then these (more restricting) limits apply.

The Clearing Member enforces such Pre-Trade Limits to the Participant applying a computational methodology, which must be notified to the Clearing House. Pre-trade Limits can indicatively but not limited to, contain the individual restrictions specified herein below or a combination of these restrictions:

- <u>Quantity limits per individual trade</u>: Maximum number of contracts with reference to a Product per Contract. With regard to this, the following limit is taken into account in accordance with the respective type of Order:
 - a) maximum number of contracts per Order, in as far as such do not refer to Linked Orders or,
 - b) maximum number of contracts per Linked Order with reference to certain Products.
- <u>Total purchase quantity limit</u>: Limit that constitutes a maximum amount of contracts a Participant can trade within a timeframe defined by the Market Operator, e.g. one Trading Day or one trading session.
- 3) **Financial limits (or cash limits)**: Maximum amount of available margins for further trading activities (maximum financial exposure up to which a Participant can trade) within a timeframe defined by the Market Operator, e.g. between two Clearing House booking cuts or on one Trading Day.



If one of the above mentioned limits is reached, the electronic system of the Clearing House can take measures to stop the forwarding of Orders by the Participant concerned into the Trading Platform and, hence, discontinue the matching of such with other Orders. Orders which have already been entered into the Order Books are deleted / cancelled.

Pre-Trade Limits are sent by the electronic system of the Clearing House to the Trading Platform of the Market Operator in real time. Non-conforming Orders are automatically rejected by the Trading Platform of the Market Operator; hence, they do not lead to an increase of the risk position of the Participant at the market.

4.8.2.3 **Pre-clearing limits**

The Clearing House is entitled to apply separate Pre-Clearing Limits to the trades concluded in the Trading Platform of the Market Operator. The concluded trades that do not conform to these limits are rejected by the Clearing House; hence, they do not lead to an increase of the Participant's risk position at the Clearing House.

Specifically, the Clearing House reserves the right to reject Forward Market transactions in their entirety or in part in which Participants (acting as Non-Clearing Members) affected by the Emergency Member Stop but also Non-Clearing Members not affected are involved as counterparties and which are to be imported into the Clearing Platform of the Clearing House as early as after the activation of the Stop Button and under consideration of the overall risk for the Clearing House. The Clearing House will inform the affected markets of this fact forthwith. Furthermore, following the activation of the Stop Button, so-called Stop Requests will be sent to all other markets on which the Participant (Non-Clearing Member) is admitted as a Participant. As a result of the Stop Requests, the suspension of the Non-Clearing Member is also requested for these markets.

If a Participant (Non-Clearing Member) is excluded from trading, its Clearing Member shall have the right in respect to any transaction concluded or registered by such Non-Clearing Member, to exercise any options itself or close or transfer transactions which have not yet been fulfilled (paid) to another Clearing Member.

In case a Clearing Member or its Non-Clearing Member fail to fulfill their financial obligations towards the Clearing House, the Clearing Member as well as its Non-Clearing Members (Participants) can be excluded from trading on the markets upon a request by the Clearing House for the duration of the default. Moreover, the transactions on all accounts which have not been fulfilled (paid) and for whose clearing the Clearing Member is responsible can be closed out or transferred to another Clearing Member by the Clearing House, based on its Clearing Rules.

4.9 **Emergency Situations**

4.9.1 Emergency situations in case of non-availability of the Trading Platform



* Actions of the Market Operator

When there is failure on any part of the Trading Platform, which may not be restored within a small period of time and which renders the communication with Participants through the Energy Trading System and/or the normal execution in the Energy Trading System of one or more essential market processes impossible, the Market Operator shall immediately:

- 1) effectuate the "trading on behalf" process (as detailed below) or stop the current Forward Market session (in case "trading on behalf" is not possible);
- 2) issue an Emergency Declaration;
- 3) inform the Clearing House for the event;
- 4) establish a tentative duration time for the event,
- 5) issue instructions to Participants electronically or using alternative communication methods; and
- 6) establish the alternative communication methods with which Participants shall communicate with the Market Operator.

During the term of validity of the Emergency Declaration, the respective market is in an Emergency Situation⁸.

Immediately after the event has concluded, the Market Operator shall issue a Restoration of Market Normal Operation Declaration (electronically or using alternative notification methods), where it shall state the time of termination of the Emergency Situation and establish the time schedule of the Market Operator's actions to restore the normal operation of the market and establish the time of resumption of normal market operation.

Within a reasonable time period from the restoration of normal market operation, the Market Operator shall, after having investigated the causes of the event, prepare a report where it shall include information regarding the Emergency Situation and in particular the causes, and justify the suitability of the measures and actions it has decided on, in order to restore normal market operation. Such report shall be submitted to the Regulator and published by the Market Operator in its website.

The Market Operator shall not be held liable for any damage caused to a Participant due to an Emergency Situation.

✤ <u>"Trading on behalf" process</u>

⁸ It should be noted that any reason reduced to financial issues or to the prices of Orders shall not justify the issue of an Emergency Declaration.



In particular in the event of technical malfunctions or other obstacles to access to the Trading Platform on the part of a Participant, the Market Operator can make entries in the Trading Platform on behalf of the Participant and in accordance with specific instructions and for said party (trading on behalf). Trading-on-behalf instructions may only be issued by a licensed Exchange Trader of the Participant concerned. The Market Operator checks the legitimation for submitting Orders by the active user login. Orders can be issued via phone (in such case phone recording is active), in text form (fax, e-mail) or in writing.

The Market Operator shall only be liable for cases of damage which a Participant sustains in the context of trading on behalf, in particular, on account of incorrect entries in as far as premeditation or gross negligence on the part of its bodies or vicarious bodies can be proven.

In this case, however, the liability of the Market Operator shall be limited to the amount of the damage typical of the contract which was foreseeable upon the conclusion of the contract. The Market Operator is entitled to refuse Orders for trading on behalf without having to provide reasons.

4.9.2 Actions of the Market Operator concerning the Nomination Platform

When there is failure on any part of the Nomination Platform, which may not be restored within a small period of time, the Market Operator shall gradually take the following actions:

- 1) As a first step, the Market Operator may extend the deadline for the registration of the Forward Contracts until the Physical Delivery Nomination Gate Closure (10:00 EET in day D-1).
- 2) In case the Emergency Situation extends beyond the Physical Delivery Nomination Gate Closure Time (10:00 EET in day D-1), the Market Operator may extend the Physical Delivery Nomination Gate Closure Time for a few hours and instruct the Clearing House and the Participants to submit directly their Physical Delivery/Offtake Nominations (without the registration of the Forward Contracts).
- 3) In case the duration of the Emergency Situation is even longer, the Market Operator may instruct:
 - a) the TSO to submit the Available Capacity of Generating Units and RES Units and Long-Term and Short-Term Physical Transmission Rights
 - b) the Clearing House to register all Exchange Based and Bilateral OTC Net Delivery Positions


c) Participants to submit their Physical Delivery/Offtake Nominations, and

electronically via e-mail, or using alternative notification methods (fax machines).

4) In case all means for the registration of Forward Contracts and Physical Delivery/Offtake Nominations are not available, the Market Operator may suspend the registration of Forward Contracts and Physical Delivery/Offtake Nominations for the Clearing House and the Participants. In such case, the submission of the Available Capacity of Generating Units and RES Units and Long-Term and Short-Term Physical Transmission Rights are also suspended.

In case of suspension of the registration of the Forward Contracts and Physical Delivery/Offtake Nominations for some or all Participants, these Participants shall have to participate in the Day-Ahead Market in order to buy/sell the respective energy quantities that would be included in the suspended Forward Contracts.

In case of suspension of the submission of Non-Availability Declarations, the Market Operator shall communicate by any available means with the Participants, in order to get information concerning the Available Capacity of their Generating Units / RES Units. In case such communication is not possible for some Participants, the Market Operator shall consider the Registered Capacity included in the Generating Units Registry and in the RES Unit Registry as the Available Capacity of these entities.

4.10 Monitoring Procedures

In order for any market to function properly, one needs to have confidence in the pricing mechanisms, in the transparency of price relevant information and the integrity of the market.

The EU Regulation No 1227/2011 on the transparency and integrity of energy markets (REMIT), published in the Official Journal of the European Union on 8 December 2011, defines the notion of "market abuse" on wholesale energy markets, classified as "**market manipulation**" and "**insider trading**." For the derivatives market, MAD is the appropriate Market Surveillance Directive. According to 4425/2016, RAE is responsible for monitoring the Forward Market and the Market Operator.

The term "market manipulation" refers to:

 a) transactions or Orders to trade: (a) which give, or are likely to give, false or misleading signals as to the supply of, demand for or price of a Product, or (b) which secure, by a person, or persons acting in collaboration, the price of one or several Products at an abnormal or artificial level, unless the person who entered into the transactions or issued the Orders to trade establishes that his reasons for



so doing are legitimate, and that these transactions or Orders to trade conform to accepted market practices; or,

- b) transactions or Orders to trade which employ fictitious devices or any other form of deception or contrivance; or,
- c) dissemination of information through the media, including the Internet, or by any other means, which gives, or is likely to give, false or misleading signals as to listed Products of the Forward Market, including the dissemination of rumors and false or misleading news, where the person who made the dissemination knew, or ought to have known, that the information was false or misleading.

The term "inside information" refers to:

a) any information relating directly or indirectly to one or more listed Products of the Forward Market, which is likely to impact prices of these Products and which has not been made public, although Participants would expect to receive such information, in accordance with accepted market practice.

In the context of safeguarding that the processes of trading and pricing are carried out fairly and free from "market abuse", the market conduct of Participants in the Forward Market shall be continuously monitored and possible breaches of the trading rules or applicable laws shall be investigated.

This central task of the Forward Market shall be discharged by an autonomous and independent body of the Market Operator, the <u>Market Surveillance Department</u>. Market Surveillance shall have an important role in establishing and maintaining the above mentioned confidence and integrity of the Forward Market, by having a strong and visible presence in the market.

Essentially, the Market Surveillance Department shall record all the data regarding forward trading and settlement of transactions, on a daily basis, evaluate these and carry out any investigation activities which might be required. The Management Board of the Market Operator may direct the Market Surveillance Department to carry out such investigations. The Market Surveillance Department shall have special rights, to demand and obtain information, in order to be able to fulfill its tasks.

The above mentioned EU Regulation No 1227/2011 on the transparency and integrity of energy markets (REMIT) adds up for European Electricity Forward Markets, new oversight and monitoring activities. These imply a mandatory reporting of any potential "market abuse" to the Regulatory Authority for Energy (RAE), as well as the establishment and maintenance of appropriate procedures, aimed at the identification of any "market manipulation" and/or "insider trading" conduct. Again, according to 4425/2016, RAE is responsible for monitoring the Forward Market and the Market Operator. However, there is still some ambiguity regarding the consistency of this law with EU regulations. Further legal advice is required to resolve this matter.



In the following, the monitoring procedures for the Greek Forward Electricity Market are presented, based on the EU Regulation's guidelines:

The Participants shall commit to fairness towards the Forward Market and the other Participants. They shall only conclude transactions on the Forward Market, in compliance with the customary trade practices and the principles of professional market traders. In order to safeguard free, transparent and fair trading, any form of manipulation of forward trading and the forward prices, as well as the unfair use of the Forward Market and its facilities shall be banned.

The following, in particular, shall be banned:

- 1. Entering of Orders without trading interests ("fictitious Orders"). Entering of Orders which are not intended to lead to the conclusion of a transaction ("fictitious Orders") and suitable to influence forward prices shall be banned.
- 2. The conclusion of transactions suitable for a manipulation of the forward prices ("misleading trading transactions"). The conscious conclusion of transactions which are suitable for setting incorrect or misleading signals, regarding the supply or the demand for the Products traded on the Forward Market or establishing an artificial price level shall be banned.
- 3. Collusions or the collusive co-operation of Participants, among each other, or with third parties. Any collusive co-operation of Participants among each other or with third parties which is suitable for influencing trading on the Forward Market shall be banned.
- 4. Influencing of Daily Settlement Prices, so that these do not reflect the fair market value. Any influencing of the Daily Settlement Price and, in particular, any attempts at achieving a deviation of the Daily Settlement Price from the fair market value by means of the conclusion of transactions or by entering Orders shall be banned.

The Participants, beyond the pure forward trading, shall also support the Forward Market in further developing the transparency of the activities on the market and the information of the public. They shall not use any information in an illegal or improper manner either for themselves or for others.

Participants, in particular, shall be banned from:

 trading when holding "inside information". The Participant (including its Board of Directors and employees) shall immediately disclose to the operation of the Forward Market all "inside information". The Participant shall also be subject to a duty of confidentiality in respect of "inside information", and may not disclose any "inside information" to persons or entities, whom such information does not concern, prior to the information being distributed to and published by the Forward Market.



- 2. publishing or disseminating market-relevant information in an intentionally incorrect manner, or in such a manner that said information might have a confusing effect on the Participants. Market-relevant information comprises the information which is significant for the evaluation or pricing, regarding one of the Products traded on the Forward Market.
- 3. holding back market-relevant information with the intention of misusing such information, if this violates statutory disclosure duties.
- 4. carrying out other acts of deception, suitable for having an improper effect on the market or the Daily Settlement Price of the Products traded on the Forward Market.

Essentially, Market Surveillance is looking for any matters, related to the Participants' business in the market, that are likely to have a substantial impact on the prices. When an assessment is made as to whether an Order or transaction violates the above mentioned rules, the following non-exhaustive signals, which should not necessarily be deemed in themselves to constitute "market manipulation" or "insider trading", shall be taken into account by the Market Surveillance Department:

- a) the extent to which Orders submitted or transactions undertaken represent a significant proportion of the daily volume of transactions in the relevant Product, in particular when these activities lead to a significant change in Daily Settlement Price of the relevant Product;
- b) whether transactions undertaken by the Participants lead to no change in beneficial ownership of a Product;
- c) the extent to which Orders submitted or transactions undertaken include Position reversals in a short period and represent a significant proportion of the daily volume of transactions in the relevant Product concerned, and might be associated with significant changes in the price of the relevant Product;
- d) the extent to which Orders submitted or transactions undertaken are concentrated within a short time span in the Market Session, and lead to a price change which is subsequently reversed;
- e) the extent to which Orders submitted change the representation of the best Bid or best Offer prices in a Product, or more generally the representation of the Order Book available to Participants, and are removed before they are executed;
- f) whether Orders submitted or transactions undertaken by persons are preceded or followed by dissemination of false or misleading information by the same persons, or persons linked to them; and,
- g) whether Orders submitted or transactions undertaken by persons, before or after the same persons or persons linked to them produce or disseminate research or investment recommendations, which are erroneous or biased or demonstrably influenced by material interest.



Market Surveillance shall initiate an investigation in dialogue with the Participant(s), if during continuous monitoring the suspicion arises that rules have been breached. If this is not dismissed after initial clarification, a case shall be opened. Market Surveillance shall continue investigations, asking for data from the relevant Participant(s), and if relevant, other parties or authorities. All information acquired in investigations and cases handled by Market Surveillance shall be treated as strictly confidential and only authorized personnel shall have access to the department's premises.

If any investigations lead to the conclusion of a performed breach on the above mentioned rules, the case shall be brought forward to the Forward Market's **Disciplinary Committee**. The Disciplinary Committee shall be appointed by the Board of Directors of the Market Operator to advise the Board in disciplinary matters under the market conduct rules. The Committee shall consist of independent external persons (three or five members appointed by the Board for a two year term - one member shall preferably be a person with updated market knowledge, a second member shall preferably be a qualified lawyer with expertise in electricity markets trading, while a third member preferably shall be an employee of the Forward Market), and shall give its recommendations to the Board of Directors of the Market Operator, concerning possible sanctions.

The Disciplinary Committee may, in special circumstances, conduct its own investigations including by assigning tasks to qualified lawyers and other experts, at the cost of the Market Operator. The Board shall be pre-notified and may veto any assignment at its discretion, or set limits for the costs to be accrued.

The Disciplinary Committee shall present its recommendation to the Board as soon as possible, and at latest within four (4) weeks from the time of receiving the case, unless the Board extends this time limit. The recommendation shall be in writing, with copies to the Participant(s) involved, and include a factual description with legal reasons.

After the Disciplinary Committee's recommendation, the Board shall in its full discretion decide if and what disciplinary sanctions shall be applied against the Participant(s). The Board's decision shall be notified to the relevant Participant(s), and the Disciplinary Committee. Any sanction imposed by the Board shall then be published in the electronic media of the Forward Market.

An investigation that concludes that a Participant has violated the rules shall be sanctioned by the Forward Market, by either:

- an oral warning,
- a warning in writing,
- a violation charge imposed on the Participant. Such charge shall be decided taking into account the nature and severity of the breach, including whether the breach has been intentional, whether the Participant or its Board of Directors or employees



may otherwise be blamed, any mitigating circumstances, as well as other relevant factors.

In cases where the Participant does not comply with the duty to provide information on request by the Forward Market in relation to investigations, the Forward Market may impose a daily charge until the information is provided.

Any sanctions made by the Forward Market shall be able to be appealed to <u>the Appeal</u> <u>**Board**</u>, which shall be a publicly appointed and independent appeal body for the Forward Market's administrative decisions.

Finally, the Market Surveillance Department shall regularly publish reports concerning warnings or sanctions imposed for the previous period. Any sanctions imposed shall be published after taking effect.



5 Bilateral OTC Market

5.1 Introduction

A great amount of wholesale electricity trading in the forward timescale, in most European countries, takes place bilaterally through Bilateral Over-the-Counter (OTC) Contracts. Additionally, as provisioned in paragraph 3 of Article 6 of the Forward Market Code the Participants have the right to participate in the Forward Market on a bilateral basis by

registering the Bilateral OTC Contracts at the Nomination Platform of the Market Operator.

Like in the Exchange-Based Forward Market, Participants use bilateral transactions to address the price risk, by Bilateral OTC Contracts are being traded outside the Exchange-Based Forward Market.

locking in prices and quantities and limiting their exposure to the more volatile Spot Market. In this context, Bilateral OTC Contracts can be bought and resold (thus being utilized also as financial instruments), and they can be regarded as corresponding instruments in the Forward Market.

In case of bilateral trading, all Forward Contract Specifications included in a Bilateral OTC Contract are at the sole discretion of the Delivering Participant and the Receiving Participant, apart from those affected by power mitigation rules, as decided by the Regulator or the Position, Pre-Trade and Pre-Clearing Limits set by the Market Operator.

The energy quantities underlying each Bilateral OTC Contract that has been concluded by two Participants shall be financially settled and submitted to the Nomination Platform by the Clearing House as analytically described in Chapters 6 and 7.

More specifically, Participants shall submit in the electronic system of the Clearing House standardized Bilateral OTC Contracts, by specifying the counterparty, electricity volume and trading price. The receiver of such an order (counterparty) can either accept or reject the bilateral transaction which has been submitted in the electronic system of the Clearing House.

Although the conclusion of the relevant bilateral transaction is based on the counterparties' preferences, detailed contractual terms should comply with typically Exchange-Based Forward Contracts accepted in the Exchange-Based Forward Market and constitute an admissible entry in the electronic system of the Clearing House.

Pre-Agreed price trading procedures have been presented earlier in Section 4.6.

5.2 Typical Bilateral OTC Contracts in European markets



The Bilateral OTC Markets, especially in the liquid electricity markets of central and north European countries, utilize a great variety of Products, in the form of either standardized contracts or non-standardized contracts with the capability of adapting contractual terms based on the counterparties' negotiations. General characteristics of Bilateral OTC Contracts, concluded in most European Bilateral OTC Markets, are presented in the following *Table*:

	Typical European Bilateral OTC Contracts
Type of Contracts	 Baseload contracts Peakload contracts Off-peak load contracts Hourly contracts for specific hours of the delivery day, based on the OTC contractual terms.
Delivery Periods	 Day contracts Weekend contracts Week contracts Month contracts Quarter contracts Year contracts
Indicative Tradable Delivery Periods	 <u>Day contracts:</u> the following delivery day D <u>Weekend contracts:</u> the following weekend (example: the French OTC Market) <u>Week contracts:</u> the following two weeks <u>Month contracts</u>: the following three months <u>Quarter contracts</u>: the following four quarters <u>Year contracts</u>: the following three years.
Quotation	€ per MWh.
Delivery Rate	1 MW per Contract.
Tick Size	€ 0.01 per MWh (In two decimal digits after the point).

Table 5-1: Typical Bilateral OTC Contracts in European markets

5.3 Bilateral OTC Contracts in the Greek Forward Market



As stated in the introductory Section of this Chapter, the Bilateral OTC Contracts traded in the Greek Forward Market shall not necessarily comply with the Standard Contracts traded in the Exchange-Based Forward Market. Table 5-2 below presents typical examples of Bilateral OTC Contracts that can be concluded in the Greek Forward Market.

	Bilateral OTC Contracts
Type of Contracts	Baseload contractsPeakload contracts
Delivery Periods	 Month contracts Quarter contracts Year contracts
Indicative Tradable Delivery Periods	 <u>Month contracts</u>: the following six months <u>Quarter contracts</u>: the following four quarters <u>Year contracts</u>: the following one year.
Quotation	€ per MWh.
Delivery Rate	1 MW per Contract.
Tick Size	€ 0.01 per MWh (In two decimal digits after the point).

Table 5-2: Bilateral OTC Contracts traded in the Greek Forward Market

5.4 **Physical and Financial Settlement of NOME Quantities**

The NOME energy quantities shall be exchanged through Bilateral OTC Contracts concluded between PPC (seller) and the successful Load representatives at the NOME auctions (buyers). The NOME energy quantities financial settlement shall be implemented through the Clearing House. Therefore:

- 1) The Clearing House shall nominate the Positions of PPC and the NOME buyers in the Nomination Platform, until the Position Nomination Gate Closure.
- 2) PPC and the NOME buyers shall allocate the NOME quantities to their respective resources (Generating Units of PPC, demand or exports of the NOME buyers) until the Physical Delivery Nomination Gate Closure.
- 3) The financial settlement of the NOME energy quantities at the NOME prices (under the pay-as-bid principle, with respect to the successful bids at the NOME auction)



shall be performed through the Clearing House. Specifically, the NOME buyers shall pay on daily basis the purchased NOME energy quantities after the physical delivery, namely in day D+1 (where D is the Delivery Day).

4) The remaining charges (in case of misuse of the NOME energy quantities) shall remain, and they shall be computed by the Market Operator, and imposed to the NOME buyers (as is the case today).



6 Physical Settlement of Forward Contracts: Registration

6.1 Introduction

This Chapter presents the methodology used for calculating the Net Delivery Positions and the process followed for the registration of these calculated Net Delivery Positions separately for the Exchange Based Forward Contracts and the Bilateral OTC Contracts by the Clearing House.

6.2 Calculation of the Net Delivery Positions

Participants have the obligation of arranging the actual **Physical Delivery** of the electricity as expressed in their overall Net Delivery Position in the forward timescale, in the Day-Ahead Market. In the following we present the procedures for the calculation of these Net Delivery Positions.

For each Delivery Hour h of the Delivery Day D, the Exchange Based Net Delivery Position (NDPx) for each Participant p shall be calculated as the sum of the sale minus the purchase of the Exchange Based Forward Contracts that include the said Delivery Hour, concluded by the Participant in the Exchange Based Forward Market.

For each Delivery Hour h of the Delivery Day D, the Bilateral OTC Net Delivery Position (NDP_{BOTC}) for each Participant shall be calculated as the sum of the sale minus the purchase of Bilateral OTC Contracts concluded by the Participant.

An NDP_x or an NDP_{BOTC} with a positive value means that the Forward Contracts sold for the Delivery Hour are more than the Forward Contracts bought for the same Delivery Hour, while an NDP_x or an NDP_{BOTC} with a negative value means that the Forward Contracts bought for the Delivery Hour are more than the Forward Contracts sold for the same Delivery Hour.

The Nomination Platforms calculates the sum of positive NDP_X or an NDP_{BOTC} for each Participant as follows:

 $NDP_{pos} = max(NDP_{x,0}) + max(NDP_{BOTC},0)$

The Nomination Platforms calculates the sum of negative NDP_X or an NDP_{BOTC} for each Participant as follows:

 $NDP_{neg} = min(NDP_{X},0) + min(NDP_{BOTC},0)$

6.3 Forward Contracts Registration



The Clearing House acting on behalf of the Participants must register corresponding energy quantities for all Delivery Periods of each Delivery Day on a portfolio basis on the Market Operator's dedicated Nomination Platform.

Standard Year Contracts and Standard Quarter Forward Contracts ultimately cascade into Standard Month Forward Contracts. <u>Thus, the Physical Settlement of any Forward</u> <u>Contract (year, quarter, month) refers to the arrangements that take place for the</u> <u>actual delivery of the electricity underlying each (cascaded) Standard Month</u> <u>Forward Contract (arrangements for the injection or withdrawal of energy in the</u> <u>Transmission System during the delivery month).</u>

Month Exchange Based Forward Contracts as well as Month Bilateral OTC Contracts shall

be physically settled, through registration on the **Nomination Platform** of the electricity underlying each contract. More specifically, from the Forward Contracts Registration Gate Opening Time and not later than the Forward Contracts Registration Gate Closure Time (17:00 EET in calendar day D-2 for the energy schedules of Delivery Day D), the Nomination

The Forward and the Bilateral OTC Contract quantities are contracted on a portfolio basis.

Platform of the Market Operator shall determine the Exchange Based Net Delivery **Position (NDP_x)** and the Bilateral OTC Net Delivery Position (NDP_{BOTC}) of each Participant, with regard to all the hours of the Delivery Day D. The relevant NDPs calculations shall be made in the Nomination Platform, after the Forward Contracts Registration Gate Closure Time in day D-2.

As referred above, the Market Operator operates an electronic Nomination Platform where the Clearing House, on behalf of the Participants having traded energy quantities on the Exchange Based Forward Market or on bilateral basis, must register corresponding energy quantities for all Delivery Periods of each Delivery Day on a portfolio basis. The Exchange Based Forward Contracts and the Bilateral OTC Contracts shall subsequently be physically settled through Physical Delivery Nominations and Physical Offtake Nominations as analytical described in the next Chapter (to be inserted as Priority Price-Taking Orders in the Day-Ahead Market by the Market Operator).

The Nomination Platform shall be open (a) for the submission of registration of the Forward Contracts and (b) for the submission of the Physical Delivery / Offtake Nominations (10:00 EET 380 calendar days before the Delivery Day to 10:00 EET one calendar day before the Delivery Day (D-1) for the energy quantities (Exchange Based Forward Contracts and the Bilateral OTC Contracts) corresponding to the Delivery Periods of Delivery Day D.



7 Physical Settlement of Forward Contracts: Nomination

7.1 Introduction

All the forward processes shall be performed by the Participants on a portfolio basis, meaning that Orders in the Forward Market shall refer to the participants' portfolio, without ex-ante defining the Entities that shall be involved in the energy trading⁹.

7.2 Physical Delivery Nominations

As far as the Physical Delivery of the forward quantities is concerned, the Producers, RES Producers, RES Aggregators and Traders performing imports utilizing their Long-Term PTRs must allocate the energy quantities included in the Forward Contract Registrations to their production resources or to imports per interconnection, for the physical settlement of the electricity underlying the Exchange Based Net Delivery Position (NDP_x) and the Bilateral OTC Net Delivery Position (NDP_{BOTC}). Participants having multiple roles may include in their Physical Delivery Nominations any possible set of Generating Units, RES Units and RES Portfolios and imports, in order to cover the sum of their positive amounts of NDP_x and NDP_{BOTC} under the condition that the sum of the nominated energy quantities included in the Physical Delivery Nominations is exactly equal to their NDP_{pos} as calculated in Section 6.2.

The Physical Delivery Nominations shall be allocated, at the latest by the Physical Delivery Nomination Gate Closure Time in day D-1 for the Delivery Day D which is 10:00 EET in day D-1, as follows:

- a) per Generating Unit by the Producers;
- b) per RES Unit or per RES Portfolio registered in the Participant Account of a RES Producer;
- c) per RES Portfolio represented by a RES Aggregator;

⁹ The Forward Market theoretically could also be designed on a unit basis (maintaining a different trading account for each Generating Unit), implying that Participants (on the generation side) can submit Orders for each of their Generating Units separately. In this case though, it is difficult for a Generating Unit to estimate the exact supply conditions over a long period of time and effectively bid in the Forward Market for the said Delivery Period (e.g. sell a baseload Standard Year Contract of 50 MW and be obligated to deliver that energy for a whole year). The portfolio-based approach deals better with this problem, since the Producer can counteract generating possibilities within its portfolio over the given timeframe and be able to deliver the contracted energy in a more efficient and continuous manner.



- d) per RES Portfolio represented by the Last Resort Aggregator; and
- e) per border by the Participants utilizing their long-term import PTRs.

Physical Delivery Nominations shall include at least the following information:

- a) the Delivering Participant EIC Code;
- b) the Generating Unit EIC Code or RES Unit EIC Code or RES Portfolio EIC Code or interconnection EIC Code;
- c) the Delivery Day and Delivery Period; and
- d) the energy quantity to be delivered, in MWh up to 3 decimal points.

Physical Delivery Nomination may be submitted many times by each Participant. The most updated Physical Delivery Nomination submitted by the Physical Delivery Nomination Gate Closure Time (10:00 EET in day D-1) is considered as the Physical Delivery Nomination for the corresponding Entities.

The Physical Delivery Nominations must respect each Generating Unit's and RES Unit's Available Capacity.

7.3 Physical Offtake Nominations

As far as the Physical Offtake of the forward quantities is concerned, the Suppliers, Self-Suppliers and Traders performing exports utilizing their long-term PTRs must allocate the energy quantities included in the Forward Contract Registrations to their load entities or to exports per interconnection, for the physical settlement of the electricity underlying the Exchange Based Net Delivery Position (NDPx) and the Bilateral OTC Net Delivery Position (NDP_{BOTC}). Participants having multiple roles may include in their Physical Offtake Nominations any possible set of Auxiliary Loads of their Generating Units, Auxiliary Loads of their RES Units, Auxiliary Loads of their RES Portfolios, energy withdrawal for Dispatchable and Non-Dispatchable Load Portfolios acting as Load Representatives and exports, in order to cover NDP_{neg} under the condition that the sum of the nominated energy quantities included in the Physical Offtake Nominations is exactly equal to their NDP_{neg}.

The Physical Offtake Nominations shall be allocated, at the latest by the Physical Delivery Nomination Gate Closure Time in day D-1 for the Delivery Day D which is 10:00 EET in day D-1,, as follows:

a) per Dispatchable Load Portfolio and/or Non-Dispatchable Load Portfolio by Suppliers and Self-Suppliers;



- b) per Generating Unit or per RES Unit for the Auxiliary Loads by Producers and RES Producers, respectively; and
- c) per border by the Participants utilizing their long-term export PTRs.

Physical Offtake Nominations shall include at least the following information:

- a) the Participant EIC Code;
- b) the Dispatchable Load Portfolio EIC Code or Non-Dispatchable Load Portfolio EIC Code or Generating Unit Offtake EIC Code or RES Unit Offtake EIC Code or interconnection EIC Code;
- c) the Delivery Period and Delivery Day; and
- d) the energy quantity to be consumed or exported, in MWh up to 3 decimal points.

Physical Offtake Nomination may be submitted many times by each Participant. The most updated Physical Offtake Nomination submitted by the Physical Delivery Nomination Gate Closure Time is considered as the Physical Offtake Nomination of the corresponding load entities or exports per interconnection.

7.4 Information transfer from the Transmission System Operator to the Market Operator in terms of the Validation Checks

The TSO provides the following information to the Market Operator during calendar day D-1 for the Delivery Day D:

- the nominated Long-Term Physical Transmission Rights (LT PTRs) per border and per direction for each Delivery Period of the Delivery Day D, until thirty (30) minutes after the latest¹⁰ LT PTRs Nomination Gate Closure Time at day D-1,
- the Available Capacity of each Generating Unit and each RES Unit for each Delivery Period of the Delivery Day D, as analytically described below in this Section, and
- 3) the Entities registered in each Participant Account defining the Participant Portfolio.

As regards the Available Capacity of each Generating Unit and each RES Unit, Producers and RES Producers must submit to the Transmission System Operator Non-Availability Declarations for the Generating Units and RES Units respectively according to the provisions of the Balancing Market Code.

¹⁰ In case there are more than one LT PTRs nomination gate closures.



A Total or Partial Non-Availability Declaration issued past the Physical Delivery Nomination Gate Closure Time for a Delivery Day for which Total or Partial Non-Availability is stated shall not entitle the Producer or the RES Producer to submit a new Physical Delivery Nomination. In this case, the updated Generating Unit or RES Unit Available Capacity shall be considered in the Day-Ahead Market, in the Integrated Scheduling Process and in the Real-Time Balancing Market.

The most recent information submitted in the Total or Partial Non-Availability Declarations before Physical Delivery Nomination Gate Closure Time determines the Available Capacity of Generating Units and RES Units.

The Transmission System Operator shall submit to the Nomination Platform, on a continuous basis upon receipt and acceptance of the Total or Partial Non-Availability Declaration of the Participant, the Available Capacity of the Generating Units and RES Units for the Delivery Day.

The last updated Available Capacity of Generating Units and RES Units is used by the Market Operator for the validation process of the Physical Delivery Nominations submitted to the Nomination Platform, as described in the following Section 7.5.

7.5 Validation Checks performed by the Market Operator

The Physical Delivery Nominations and Physical Offtake Nominations are submitted sequentially by each Participant. In each successful submission, the Nomination Platform recalculates for each Delivery Hour of the Delivery Day the remaining quantity, NDP_{pos-rem} and NDP_{neg-rem} respectively, to be covered through Physical Delivery Nominations and Physical Offtake Nominations for each Participant.

Following the submission of Physical Delivery Nominations and Physical Offtake Nominations by the Participants, the Nomination Platform of the Market Operator performs the following four (4) validation checks:

<u>**1**st validation check</u>: In case the energy quantity included in a Physical Delivery Nomination is higher than the remaining quantity NDP_{pos-rem} for one or more Delivery Periods of the Delivery Day, then the Physical Delivery Nomination is considered as non-valid.

<u> 2^{nd} </u> validation check: In case the energy quantity included in a Physical Offtake Nomination is higher than the remaining quantity NDP_{neg-rem} for one or more Delivery Periods of the Delivery Day, then the Physical Offtake Nomination is considered as non-valid.

<u>**3**rd</u> validation check: In case the energy quantity allocated to a Generating Unit by a Producer or to a RES Unit by a RES Producer is higher than the Available Capacity of



such Generating Unit or RES Unit, respectively, then the Physical Delivery Nomination for this Unit is considered as non-valid.

<u>4th validation check</u>: In case the energy quantity allocated to an interconnection for imports or exports is higher than the nominated LT PTRs at the same interconnection, then this Physical Delivery Nomination and Physical Offtake Nomination, for the respective interconnection is considered as non-valid.

Immediately after performing the validation checks described above, the Nomination Platform informs the Participants concerning the validity or rejection of a Physical Delivery Nomination or a Physical Offtake Nomination. In each successful submission, the Nomination Platform recalculates for each Delivery Period of the Delivery Day the remaining quantity, NDP_{pos-rem} and NDP_{neg-rem} respectively, to be covered through Physical Delivery Nominations and Physical Offtake Nominations for each Participant.

7.6 Actions of the Market Operator after the Physical Delivery Nomination Gate Closure Time

Following the above-mentioned validation checks and after the Physical Delivery Nomination Gate Closure Time, the Market Operator issues either:

- a) a confirmation that the submitted Physical Delivery Nominations and/or Physical Offtake Nominations fully covers the NDP_{pos-rem} and NDP_{neg-rem} respectively; in such case, the Participant is not allowed to perform any changes in the submitted and validated Physical Delivery Nominations and/or Physical Offtake Nominations; or
- b) a notification that the submitted Physical Delivery Nominations and/or Physical Offtake Nominations do not pass fully cover the NDP_{pos-rem} and NDP_{neg-rem} respectively, stating the NDP_{pos-rem} and NDP_{neg-rem} per Delivery Period; in such case, the Participant is obligated to submit additional Physical Delivery Nominations and/or Physical Offtake Nominations at the latest thirty (30) minutes after the Physical Delivery Nomination Gate Closure Time. In case:
- (1) the Participant does not submit additional Physical Delivery Nominations or
- (2) the submitted additional Physical Delivery Nominations do not fully cover the NDP_{pos-} rem, then the Market Operator calculates for each Participant p and for each Delivery Period t of Delivery Day d the Participant Positive Forward Market Mismatch Quantity, PPFMMQ_{p,t,d}, as follows:

 $PPFMMQ_{p,t,d} = NDP_{pos} - Sum(i=1,N)(PDN_i)$

and imposes a non-compliance charge calculated equal to the product of the absolute value of the Participant Positive Forward Market Mismatch Quantity, $PPFMMQ_{p,t,d}$ and an

Administratively Defined Position Nomination Penalty Price:



In case:

- (1) the Participant does not submit additional Physical Offtake Nominations, or
- (2) the submitted additional Physical Offtake Nominations do not fully cover the NDP_{neg-rem}, then the Market Operator calculates for each Participant p and for each Delivery Period t of Delivery Day d the Participant Negative Forward Market Mismatch Quantity, PNFMMQ_{p,t,d}, as follows:

 $PNFMMQ_{p,t,d} = NDP_{neg} - Sum(i=1,N)(PON_i)$

and imposes a non-compliance charge calculated equal to the product of the absolute value of the Participant Negative Forward Market Mismatch Quantity, *PNFMMQ*_{p.t.d} and an Administratively Defined Position Nomination Penalty Price.

The value of the Administratively Defined Position Nomination Penalty Price shall be proposed by the Market Operator and approved by the Regulator. Such decision shall be taken at least two months prior to the end of a calendar year, it shall be in force for the next calendar year and it cannot be modified within such year.

7.7 Physical Delivery of the validated Physical Delivery and Offtake Nominations

The energy quantities of the validated Physical Delivery and Offtake Nominations shall be physically settled through the submission of Priority Price-Taking Orders in the Day-Ahead Market by the Market Operator on behalf of the Participants and their acceptance in the Day-Ahead Market results, as described in the Detailed Day-Ahead Market Design Report.



8 Financial Settlement of Forward Contracts

8.1 Introduction

After the opening of a Forward Position, by buying or selling one or more Exchange Based Forward Contracts, and until its Expiry Day or the closing of the Forward Position, the Exchange Based Forward Contract is settled every day through Mark-to-Market Settlement and is rewritten at a new Forward Price.

Mark-to-Market Settlement denotes that if the Daily Settlement Price is increased on a certain day, the difference in price multiplied with the volume of the Exchange Based Forward Contract is credited on the buyer's account, while this amount is simultaneously debited on the seller's account according to the relative provisions of the Clearing House Rulebook.

In this sense, this Chapter presents the Financial Settlement of the Forward Contracts concluded by the Participants in the framework of the Forward Market. More specifically, Section 8.2 illustrates the methodology used for the determination of the Daily Settlement Price by the Market Operator. Section 8.3 prescribes the Financial Settlement of the Standard Month Contracts while Section 8.4 presents the Financial Settlement of the Standard Quarter and Standard Year Contracts. Finally, Section 8.5 illustrates a numerical example of the procedures described in the previous Section.

8.2 Determination of the Daily Settlement Price

In every Trading Day (at the end of each market session), a Daily Settlement Price for every individual continuously traded Forward Contract shall be established, for the purpose of the execution of all Clearing processes and specifically for the calculation of the Variation Margin for every Participant in the Forward Market. The Daily Settlement Price for every individual continuously traded contract shall be established by applying the rules presented below.

The Daily Settlement Price shall be calculated and rounded to the nearest price tick, at the end of the Trading Hours on every Trading Day, as follows:

- Volume weighted average price of all the transactions executed within the last ten (10) minutes ("settlement window" / 15:20 - 15:30 pm EET) of the Market Session,
- 2) If the number of transactions executed within the last ten (10) minutes of the Market Session is less than ten (10), the volume weighted average price of the last ten (10) transactions executed within the Market Session shall determine the Daily Settlement Price.



3) If less than ten (10) transactions were realized in the Market Session, the volume weighted average price of all the transactions executed during the Market Session shall determine the Daily Settlement Price.

If the Daily Settlement Price cannot be calculated in accordance with the above-mentioned methods by the end of the Market Session, the Daily Settlement Price shall be established by using the following methods in combination:

- 1) If no transactions were realized during the Market Session, the Base Price (Daily Settlement Price of the previous Trading Day) shall determine the Daily Settlement Price.
- 2) Average of the best Buy Order and best Sell Order at the end of the Market Session,
- 3) "Theoretical" forward prices to be calculated on the basis of the Daily Settlement Price, valid for other relevant Delivery Periods to the contract.

In the event of a suspension of the Trading Platform lasting the remaining Trading Day, the Market Operator shall determine a Daily Settlement Price for every individual continuously traded contract, in accordance with the previous methods, but on the basis of the Orders and transactions registered at the time of suspension.

The Market Operator shall reserve the right to change the Daily Settlement Price, if it believes that the registered prices or Orders are manipulated, or in any other way influenced, so that they do not reflect the market value of each individual continuously traded contract. The Market Operator shall inform the Participants of such events.

The **Daily Price Movement Limits** for every traded contract shall be +/- X% of the Base Price (namely, the previous Daily Settlement Price). Tighter limits can be initially set, in order to protect the market against potential manipulation. These limits can be gradually extended, when enough liquidity in the market has been attained, and the market has been observed not to suffer from any form of manipulation of the trading procedures and the Daily Settlement Prices. The value of X % shall be established by decision of the Market Operator which shall be approved by the Regulator. Such decision shall be taken at least two (2) months prior to enforcement. No other time-constraints exist in such decisions / approvals. Note, the X% reflects the expectations of the traders for the average price of the next month(s), not the average daily SMP of a month. For example, if today the traders have an expectation for the average price of the next month of 50 €/MWh, whereas tomorrow the same traders may have an expectation for the average price of next month above 55 €/MWh or below 45 €/MWh. Based on our experience, such large changes are rare (or even not existing) in forward markets.

It should be noted that, for the purpose of the Mark-to-Market Settlement of every individual continuously traded Contract, the Daily Settlement Prices shall be established



for every Trading Day of said contract. That is, from the first day of the Trading Period for the specific contract, until the Expiry Day of the contract. After the Expiry Day of each month contract and during the delivery month, a spot referenced daily settlement shall take place (no forward settlement prices shall apply, since the Delivery Month is not tradable).

Finally, the **Final Settlement Price** shall be the Weighted Average Zonal Day-Ahead Market Clearing Price, weighted by the sum of the accepted Buy Orders of the internal Bidding Zones, for each Delivery Hour of the Delivery Month and Load Profile. The Final Settlement Price determined with the above mentioned method shall be rounded to nearest price tick.

The Market Operator shall publish in its website the Daily Settlement Prices and the Final Settlement Prices established for each applicable Forward Product.

The following examples explain the above mentioned rules for the determination of the Daily Settlement Prices, based on the Order Book (cases 1, 2 and 3 of the rules), with regard to a particular Trading Day D. For this purpose, the following Forward Contract is considered: baseload Standard Month Forward Contract for January 2014:

Example 8.1: Determination of the Daily Settlement Price based on the Order Book - More than Ten (10) Transactions within the "Settlement Window".

In this example, we suppose that more than ten (10) transactions were concluded during the "settlement window" (15:20-15:30 pm EET), with regard to a particular Trading Day D. Best Buy Orders and Best Sell Orders in the Order Book per each minute of the "settlement window" are shown in the relevant columns of the following Table 8-1.

Buy Orders and Sell Orders in grey correspond to Orders leading to the conclusion of transactions. The corresponding concluded transactions are shown in the last two columns of the Table ("Trade"). Note that these Orders (Orders in grey) may not always be Orders entered into the Order Book (they may also be Orders executed immediately after they were entered into the Trading Systems).

All prices in the Table are quoted in EUR per MWh (for simplicity, only the symbol \in is quoted in the Table).

Order Book during the "Settlement Window" – Baseload Standard Month Forward Contract (January)							
Time	Best Buy Order		Best Sell Order		Trade		Trade IDs
15:20	15 MW	€ 51.50	10 MW	€ 52.00			
15:21	15 MW	€ 51.50	3 MW	€ 51.50	3 MW	€ 51.50	Trade001
15:21	12 MW	€ 51.50	7 MW	€ 51.50	7 MW	€ 51.50	Trade002



1	I	I	I	I	I	I	I
15:21	5 MW	€ 51.50	10 MW	€ 52.00			
15:22	5 MW	€ 51.50	10 MW	€ 52.00			
15:23	10 MW	€ 52.00	10 MW	€ 52.00	10 MW	€ 52.00	Trade003
15:23	5 MW	€ 51.50	5 MW	€ 52.50			
15:24	5 MW	€ 52.50	5 MW	€ 52.50	5 MW	€ 52.50	Trade004
15:24	15 MW	€ 51.65	20 MW	€ 53.00			
15:25	15 MW	€ 51.65	8 MW	€ 51.65	8 MW	€ 51.65	Trade005
15:25	7 MW	€ 51.65	20 MW	€ 53.00			
15:26	15 MW	€ 53.00	20 MW	€ 53.00	15 MW	€ 53.00	Trade006
15:26	7 MW	€ 51.75	5 MW	€ 53.00			
15:27	7 MW	€ 51.75	7 MW	€ 51.75	7 MW	€ 51.75	Trade007
15:27	10 MW	€ 50.25	15 MW	€ 53.00			
15:28	12 MW	€ 53.00	15 MW	€ 53.00	12 MW	€ 53.00	Trade008
15:28	10 MW	€ 50.25	5 MW	€ 50.25	5 MW	€ 50.25	Trade009
15:28	5 MW	€ 50.25	3 MW	€ 53.00			
15:29	10 MW	€ 53.00	3 MW	€ 53.00	3 MW	€ 53.00	Trade010
15:29	8 MW	€ 54.50	10 MW	€ 54.50	8 MW	€ 54.50	Trade011
15:29	5 MW	€ 50.25	2 MW	€ 54.50			

Table 8-1: Order Book Situation for the Determination of the Daily Settlement Price - Example 8.1

The Daily Settlement Price in this case is EUR 52.45 per MWh. The determination of the Daily Settlement Price is calculated as shown in Table 8-2.

Determination of the Daily Settlement Price - Baseload Standard Month Forward Contract (January)					
	Calculation	Result			
Weighted Average Trade	=(51.5*7+52*10+52.5*5+51.65*8+53*15+51.75*7+53*12+50.25*				
Price	5+53*3+54.5*8) / (7+10+5+8+15+7+12+5+3+8)				
Daily Settlement Price		€ 52.45			

Table 8-2: Determination of the Daily Settlement Price - Example 8.1

Example 8.2: Determination of the Daily Settlement Price based on the Order Book - Less than Ten (10) Transactions within the "Settlement Window" - More than 10 Transactions within the Market Session.

In this example, we suppose that less than ten (10) transactions were concluded during the "settlement window" (15:20-15:30 pm EET), with regard to a particular Trading Day D. Additionally, more than ten (10) transactions were concluded during the Market Session of the day.



Best Buy Orders and Best Sell Orders in the Order Book per each minute, with regard to the last ten (10) transactions of the Market Session are shown in the relevant columns of the following Table 8-3.

Again, Buy Orders and Sell Orders highlighted in grey correspond to Orders leading to the conclusion of transactions. The corresponding concluded transactions are shown in the last two columns of the Table ("Trade").

All prices in the Table are quoted in EUR per MWh (for simplicity, only the symbol \in is quoted in the Table).

Order Book during the Last 10 Transactions of the Market Session - Baseload Month Forward (Jan.)							
Time	Best B	uy Oder	Best Se	ell Order	Tra	ade	Trade IDs
15:05	15 MW	€ 51.50	10 MW	€ 52.00			
15:08	15 MW	€ 51.50	3 MW	€ 51.50	3 MW	€ 51.50	Trade001
15:08	12 MW	€ 51.50	7 MW	€ 51.50	7 MW	€ 51.50	Trade002
15:08	5 MW	€ 51.50	10 MW	€ 52.00			
15:13	10 MW	€ 52.00	10 MW	€ 52.00	10 MW	€ 52.00	Trade003
15:13	5 MW	€ 51.50	5 MW	€ 52.50			
15:19	5 MW	€ 52.50	5 MW	€ 52.50	5 MW	€ 52.50	Trade004
15:19	5 MW	€ 51.50	20 MW	€ 53.00			
15:20	15 MW	€ 51.65	20 MW	€ 53.00			
15:21	15 MW	€ 51.65	8 MW	€ 51.65	8 MW	€ 51.65	Trade005
15:21	7 MW	€ 51.65	20 MW	€ 53.00			
15:23	15 MW	€ 53.00	20 MW	€ 53.00	15 MW	€ 53.00	Trade006
15:23	7 MW	€ 51.75	5 MW	€ 53.00			
15:24	7 MW	€ 51.75	7 MW	€ 51.75	7 MW	€ 51.75	Trade007
15:24	10 MW	€ 50.25	15 MW	€ 53.00			
15:28	12 MW	€ 53.00	15 MW	€ 53.00	12 MW	€ 53.00	Trade008
15:28	10 MW	€ 50.25	5 MW	€ 50.25	5 MW	€ 50.25	Trade009
15:28	5 MW	€ 50.25	3 MW	€ 53.00			
15:29	10 MW	€ 53.00	3 MW	€ 53.00	3 MW	€ 53.00	Trade010
15:29	5 MW	€ 50.25	10 MW	€ 54.50			

 Table 8-3: Order Book Situation for the Determination of the Daily Settlement Price - Example 8.2

The Daily Settlement Price in this case is EUR 52.19 per MWh. The determination of the Daily Settlement Price is calculated as shown in Table 8-4.



Determination of the Daily Settlement Price - Baseload Standard Month Forward Contract (January)					
Calculation					
Weighted Average Trade	=(51.5*3+51.5*7+52*10+52.5*5+51.65*8+53*15+51.75*7+				
Price	53*12+50.25*5+53*3) / (3+7+10+5+8+15+7+12+5+3)				
Daily Settlement Price		€ 52.19			

Table 8-4: Determination of the Daily Settlement Price - Example 8.2

Example 8.3: Determination of the Daily Settlement Price based on the Order Book
 Less than Ten (10) Transactions within the Market Session.

In this example, we suppose that less than ten (10) transactions were concluded during the Market Session of the relevant Trading Day D.

The Best Buy Orders, Best Sell Orders and the concluded transactions of the Market Session are shown in the relevant columns of the following Table 8-5.

Order Book during the Market Session – Baseload Standard Month Forward Contract (January)							
Time	Best Buy Order		Best Sell Order		Trade		
11:35	15 MW	€ 51.50	10 MW	€ 52.00			
12:49	15 MW	€ 51.50	10 MW	€ 51.50	10 MW	€ 51.50	
12:49	5 MW	€ 51.50	10 MW	€ 52.00			
14:23	10 MW	€ 52.00	10 MW	€ 52.00	10 MW	€ 52.00	
14:23	5 MW	€ 51.50					
14:56	5 MW	€ 51.50	5 MW	€ 52.50			
15:23	5 MW	€ 52.50	5 MW	€ 52.50	5 MW	€ 52.50	

Table 8-5: Order Book Situation for the Determination of the Daily Settlement Price - Example 8.3

The Daily Settlement Price in this case is EUR 51.90 per MWh. The determination of the Daily Settlement Price is calculated as shown in Table 8-6.

Determination of the Daily Settlement Price - Baseload Standard Month Forward Contract (January)					
	Result				
Weighted Average Trade Price	=(51.5*10+52*10+52.5*5)/(10+10+5)				
Daily Settlement Price		€ 51.90			

Table 8-6: Determination of the Daily Settlement Price - Example 8.3

8.3 Financial Settlement of Standard Month Contracts



Financial fulfillment shall take place by means of Financial Settlement, based on the Final Settlement Price. Overall, the Seller (Buyer) shall be obligated to settle the difference between the price agreed on and the higher (lower) Final Settlement Price, in cash, on the day of execution.

Financial Settlement of the Standard Month Forward shall involve both a daily Markto-Market Settlement before the Standard Month Forward Contract reaches its Expiry Day and a daily spot referenced Financial Settlement, after the Standard Month Forward Contract reaches its Expiry Day.

More specifically, Open Positions on the Standard Month Forward Contract shall be subject to a daily Mark-to-Market Settlement, which covers gains or losses from day-to-day changes in the market price of the Exchange Based Forward Contract on each Delivery Day, from the creation of the Open Position until the Expiry Day (1st D-2).

From the following day of the Expiry Day (1st D-1 on which Day-Ahead Market prices for the first Delivery Day of the month, namely 1st D, have been established) until the previous day of the last Delivery Day (Last D-1 / on which the Day-Ahead Market prices for the last Delivery Day of the month, namely Last D, have been established), the Standard Month Forward Contract shall be subject to a daily spot referenced Financial Settlement. This spot referenced Financial Settlement throughout the Delivery Month covers the difference between the Daily Settlement Price of the Standard Month Forward Contract on the Expiry Day (1st D-2) and the average Day-Ahead Market price throughout the Delivery Month, which eventually results to the Final Settlement Price (obtained by the Day-Ahead Market on Last D-1).

Throughout the period from the creation of the Open Position to the financial fulfillment (Last D) of the Standard Month Forward Contract, cash is required in the Participants' Clearing Accounts, for the engagement of the daily Mark-to-Market Settlement as well as the daily spot referenced Financial Settlement, if the Standard Month Forward Contracts have still Open Positions after the Expiry Day.





Figure 8-1: Financial Settlement of the Standard Month Forward Contract

The Clearing House shall calculate the Daily Market Settlement for each Clearing Account, by adding up and off-setting (netting) all daily settlement amounts payable by or due to the Account Holders, and in accordance with the following rules:

- The Business Day after the day the Clearing Transaction was registered, the Seller pays the Buyer any positive difference between the Daily Settlement Price on the day of the Clearing Transaction and the price of the Clearing Transaction, and the Buyer pays the Seller any negative differences.
- 2) Every subsequent Business Day, the Seller pays the Buyer any positive difference between the Daily Settlement Price on the latest Business Day and the Daily Settlement Price on the preceding Business Day, and the Buyer pays the seller any negative differences.
- 3) The first Business Day after the Expiry Day, the Seller pays the Buyer any positive difference between the Daily Settlement Price on the Expiry Day and the Daily Settlement Price on the preceding Business Day, and the Buyer pays the Seller any negative differences.

Forward Contracts that have Open Positions at the end of the Expiry Day are on each day of the Delivery Period subject to the daily spot referenced Financial Settlement, based on the daily spot market prices established on the Day-Ahead Market.

The next Business Day of the day of the establishment of the Final Settlement Price, the Seller will have ultimately paid the Buyer any positive difference between the Final



Settlement Price and the Daily Settlement Price on the Expiry Day (i.e. if the Final Settlement Price is higher than the Daily Settlement Price on the Expiry Day), and the Buyer will have paid the Seller any corresponding negative difference (i.e. if the Final Settlement Price is lower than the Daily Settlement Price on the Expiry Day).

Day of financial fulfillment for the Standard Month Forward Contract: The last Delivery Day of the Delivery Month (which is the next day of the day on which the Final Settlement Price was established). Financial fulfillment shall be carried out by closing all Open Positions on that day, via offsetting transactions by the Clearing House. It should be noted that in case the last Delivery Day of the Delivery Month is not a Business Day, financial fulfillment shall be carried out on the Business Day following the last Delivery Day of the Delivery Month.

In the following *Tables 8-7 and 8-8*, we present an analytical example, which explains the above mentioned Settlement procedures. The detailed timelines and course of payments presented in these *Tables* correspond to the previous, more illustrated, *Figure 8-1*.

Example 8.4: Producer Sells (Short Position) 30 Baseload Standard Month Forward Contracts (30 MW) for the Month January 2015.

Table 8-7 details the course of payments (Variation Margins) concerning a Producer which have sold 30 baseload Standard Month Forward Contracts (month January 2015), from 2 September 2014 (Open Position) to 2 February 2015 (financial fulfillment).

Specifically, prices in the second column are the Daily Settlement Prices of the Standard Month Forward Contract, while prices in the third column are the average Day-Ahead Market prices of the 24 hours of each Delivery Day, starting from the preceding day of the first Delivery Day of the Delivery Month January (1st D-1: We, 31/12/14).

Each one of the fourth column's prices is the average of all preceding daily Day-Ahead Market prices until the day concerned [for example on Fri, 02/01/15 the said price is EUR (51.00 + 51.20 + 52.00) per MWh / 3 = EUR 51.40 per MWh].

The fifth column shows the Variation Margins concerning the Producer. These Variation Margins arise from: (a) the Daily Mark-to-Market Settlement of the Standard Month Forward Contract from the opening of the Position until 1st D-2 [for example the Variation Margin of Thu, 04/09/14 is EUR (53.00 - 53.25) per MWh x 30 MW x 24 h/day x 31 days = EUR -5,580] and (b) the daily spot referenced financial settlement of the Standard Month Forward Contract, from 1st D-1 until Last D-1 [for example the Variation Margin of Fri, 02/01/15 is EUR (51.10 - 51.40) per MWh x 30 MW x 24 h/day x 31 days = EUR -6,696].

Finally, the last column presents the day of the Financial Settlement with regard to the Variation Margins (taking place every subsequent Business Day).



Example: Producer sells 30 Baseload Standard Month Forward Contracts (30MW) for the month January 2015.		Daily Settlement Price of the Forward Contract [€ per MWh]	Daily Baseload Day-Ahead Market Price [€ per MWh]	Average Daily Baseload Day-Ahead Market Price [€ per MWh]	Variation Margin [€] (-) Debit (+) Credit	Business Day of Financial Settlement
irket	Tue, 02/09/14 (Open Position)	53.50 (Transaction) 53.35	· -	-	+3,348	We, 03/09/14
o-Ma rent	We, 03/09/14	53.00	-	-	+7,812	Thu, 04/09/14
ark-t ettlen	Thu, 04/09/14	53.25	-	-	-5,580	Fri, 05/09/14
ily M Se						
Dai	Tue, 30/12/14 (1st D-2)	49.90	-	-	+80,352 (accumulated)	We, 31/12/14
	We, 31/12/14 (1st D-1)	-	51.00	51.00	-24,552 (51-49.90)	Fri, 02/01/15
	Thu, 01/01/15 (1 st D)	-	51.20	51.10	-2,232	Fri, 02/01/15
σ	Fri, 02/01/15	-	52.00	51.40	-6,696	Mo, 05/01/15
ence						
Daily Spot Refere Settlement	We, 28/01/15	-	48.00	50.55	+18,972 (accumulated)	Thu, 29/01/15
	Thu, 29/01/15 (Last D-2)	-	53.00	50.63	-1,785.6	Fri, 30/01/15
	Fri, 30/01/15 (Last D-1)	Final Settlement Price: 50.76	54.50	50.76	Final Variation Margin: -2,901.6	Financial Fulfillment Mo, 02/02/15
				Total	+61,156.8	

Table 8-7: Example in the Financial Settlement of the Standard Month Forward Contract

Assume now, that the Producer decides to close out its short Position in the baseload Standard Month Forward Contract (January 2015), by buying 30 baseload Standard Month Forward Contracts (30 MW) for the month January 2015, on We 17/12/14 (Close Position).

With reference to the relevant Table 8-8, the price of the closing transaction for the Producer is EUR 54.15 per MWh (transaction price), so the final Variation Margin for the Producer is EUR (54.00 - 54.15) per MWh x 30 MW x 24 h/day x 31 days = EUR -3,348.

This final Variation Margin is debited to the Producer, through a final Financial Settlement, on the following Business Day of the closing transaction (Thu, 18/12/14).



Example: Producer Month Fo the mon 02/09/201 position o	sells 30 Baseload Standard orward Contracts (30MW) for th January 2015 on Tue 4 and closes out its short n We, 17/12/2014.	Daily Settlement Price of the Forward Contract [€ per MWh]	Daily Baseload Day-Ahead Market Price [€ per MWh]	Average Daily Baseload Day-Ahead Market Price [€ per MWh]	Variation Margin [€] (-) Debit (+) Credit	Business Day of Financial Settlement
	Tue, 02/09/14 (Open Position)	53.50 (Transaction) 53.35	-	-	+3,348	We, 03/09/14
	We, 03/09/14	53.00	-	-	+7,812	Thu, 04/09/14
ment	Thu, 04/09/14	52.75	-	-	+5,580	Fri, 05/09/14
ettle						
larket Se	Fri, 12/12/14	53.65	-	-	-20,088 (accumulated)	Mo, 15/12/14
-k-to-	Mo, 15/12/14	53.90	-	-	-5,580	Tue, 16/12/14
ily Mar	Tue, 16/12/14	54.00	-	-	-2,232	We, 17/12/14
Dai		54.15 (Transaction)			-3,348	Final
	We, 17/12/14 (Close Position)	54.20	-	-	-	Financial Settlement Thu, 18/12/14
				Total	-14,508	

Table 8-8: Example in the Financial Settlement of the Standard Month Forward Contract - Closingthe Position before the Expiry Day of the Standard Month Forward Contract

The Participant who sold to the Producer the 30 baseload Standard Month Forward Contracts on We 17/12/14, opens a corresponding short Position at a price of EUR 54.15 per MWh (transaction price) and has to cover his first Variation Margin of EUR (54.15 - 54.20) per MWh x 30 MW x 24 h/day x 31 days = EUR -1,116 for the Delivery Day on which he opens his Position (We 17/12/14). This first Variation Margin is debited to the Participant, through a first Financial Settlement, again on the following Business Day of the opening transaction (Thu, 18/12/14). The daily Settlement procedure continues in the same way for the newly opened Position of the Participant.

In this example, the Producer has ultimately lost an amount of EUR 14,508 from its engagement in the trade of the Standard Month Forward Contract. Note that, although this example is explanatory of the Settlement procedures with regard to a Producer closing out its forward Position, the example is rather relevant to a speculator's reaction to the evolution of the forward prices (than to a physical player's reaction, as in the case of a Producer). More specifically, a Producer with a short Position in the Forward Market, even if forward prices rise, would still prefer not to close out its forward Position (with the consequent losses that it incurs), but to provide physical fulfillment (Physical Delivery) via its plant, on the Spot Market. This means, that the Producer will hedge his financial



(forward) and physical (spot) Positions, leaving itself unaffected by price changes on the Spot Market. Ultimately, the Producer sells its power of 30MW at the price of EUR 53.50 per MWh (fixed price upon the conclusion of the Forward Transaction on Tue, 02/09/14), which shall be a price covering its generation costs and probably leaving the Producer with some profit.

8.4 Financial Settlement of Standard Quarter and Standard Year Contracts

A similar Settlement procedure, as the one described previously, for the Standard Month Forward Contracts, is applied in the case of Standard Quarter and Standard Year Forward Contracts. The only difference in the overall procedure concerns the Cascading mechanism which shall take place.

More specifically, on the Expiry Day of the Standard Quarter and Standard Year Forward Contracts (three Trading Days before the beginning of the Delivery Month), Open Positions in Standard Quarter and Standard Year Forward Contracts shall be subject to mandatory Cascading as depicted in the *Figures 4-2, 4-3*. Cascaded contracts span the same Delivery Month as the original contracts, with the total volume of the original contract being distributed across the cascaded contracts.

More specifically, on the Expiry Day, the holders of Standard Quarter and Standard Year Forward Contracts shall be assigned three corresponding Standard Month Forward Contracts, which taken together correspond to the Delivery Period of the Standard Quarter Forward Contract, at the same Daily Settlement Price of the Standard Quarter Forward Contract (price of the Standard Quarter Forward Contract on the Cascading Day).

Likewise, on the Expiry Day, the holders of Standard Year Forward Contracts shall be assigned the corresponding three Standard Month Forward Contracts for the following calendar months from January through to March, as well as the corresponding three Standard Month Forward Contracts for the second through to the fourth calendar quarter, which taken together correspond to the Delivery Period of the Standard Year Forward Contract, at the same Daily Settlement Price of the Standard Year Forward Contract (price of the Standard Year Forward Contract on the Cascading Day). The cascaded contracts replace the original contract and the original contract shall terminate.

The following analytical example, explains the above mentioned Settlement procedures, in the case of a Standard Year Forward Contract:

Example 8.5: Producer Sells (Short Position) 30 Baseload Standard Year Forward Contracts (30 MW) for the Year 2015.

Table 8-9 details the course of payments (Variation Margins) concerning a Producer which have sold 30 baseload Standard Year Forward Contracts (year 2015), from 1 July 2014 (Open Position) to 2 February 2015 (financial fulfillment for the 1st cascaded Standard



Month Forward Contract of month January).

Example: Producer sells 30 Baseload Standard Year Forward Contracts (30MW) for the year 2015 (365 Days).		Daily Settlement Price of the Forward Contract [€ per MWh]	Daily Baseload Day-Ahead Market Price [€ per MWh]	Average Daily Baseload Day-Ahead Market Price [€ per MWh]	Variation Margin [€] (-) Debit (+) Credit	Business Day of Financial Settlement
rk-to-	Tue, 01/07/14	53.50 (Transaction)	-	-	+39.420	We. 02/07/14
Mar ent	(Open Position)	53.35				,
aily tlem	We, 02/07/14	53.00	-	-	+91,980	Thu, 03/07/14
l's D Sett	Thu, 03/07/14	53.25	-	-	-65,700	Fri, 04/07/14
orward larket						
Year Fc M	Fri, 26/12/14	48.20	-	-	+1,327,140 (accumulated)	Mo, 29/12/14
Cascad		48.00 (Year Frw)			+52,560 (Year Frw)	_
ing	Mo, 29/12/14 (1st D-3)	49.50 (Month Frw)	-	-	-33,480 (Month Frw)	Tue, 30/12/14
ot	Tue, 30/12/14 (1 st D-2)	49.90	-	-	-8,928	We, 31/12/14
ly S _l ent	We, 31/12/14 (1 st D-1)	-	51.00	51.00	-24,552	Fri, 02/01/15
: Dai tlem	Thu, 01/01/15 (1st D)	-	51.20	51.10	-2,232	Fri, 02/01/15
ard's Sett	Fri, 02/01/15	-	52.00	51.40	-6,696	Mo, 05/01/15
orwa						
Month F	We, 28/01/15	-	48.00	50.55	+18,972 (accumulated)	Thu, 29/01/15
1	Thu, 29/01/15 (Last D-2)	-	53.00	50.63	-1,785.6	Fri, 30/01/15
Final Spot Referenced Settlement	Fri, 30/01/15 (Last D-1)	Final Settlement Price: 50.76	54.50	50.76	Final Variation Margin: -2,901.6	Final Cash Settlement Mo, 02/02/15
				Total (1 st Month)	+61,156.8	

Table 8-9: Example in the Settlement of the Standard Year Forward Contract

Again, prices in the second column are the Daily Settlement Prices of the Forward Contract, while prices in the third column refer to the first cascaded month of January and they are the average DAM prices of the 24 hours of each Delivery Day, starting from the preceding day of the first Delivery Day of the Delivery Month January (1st D-1: We, 31/12/14). The calculation of the Variation Margins with regard to the Standard Year Forward Contract's daily Mark-to-Market Settlement and the 1st Standard Month Forward Contract's (January) daily spot referenced Settlement, as well as the final spot referenced Settlement, is done in the same concept with the previous Example 8.4.



Note, that on the day of Cascading (1st D-3: Mo, 29/12/14), two Variation Margins have to be considered, as follows: EUR (48.20 - 48.00) per MWh x 30 MW x 24 h/day x 365 days = EUR +52,560 and EUR (48.00 - 49.50) per MWh x 30 MW x 24 h/day x 31 days = EUR - 33,480. The corresponding Variations Margins with regard to the rest of the cascaded contracts (Standard Month Forward Contract of February, Standard Month Forward Contract of March and Standard Quarter Forward Contracts Q2, Q3, Q4) have also to be calculated and settled accordingly.

8.5 Daily Financial Settlement and Fulfillment Example

The following example is intended to clarify the above-mentioned procedure with regard to a forward transaction, along with the Financial Settlement for the Participants involved. For simplicity, only one forward transaction is considered below.

Suppose that the following forward transaction has been made in the Forward Market: Participant A has sold 20 MW for 50 €/MWh on the baseload Standard Month Forward Contract, for the month of July.

The following Figure, illustrates the procedures and timelines with regard to the calculation of the NDPs for said Participants, the allocation of the forward quantities (Participant A declares to produce 20 MW from his generating unit in the North zone, while Participant B declares to consume 20 MW in the South zone of Greece), and the insertion of the declared quantities as "Priority Price-Taking" Orders in the DAM.





Cases 1, 2, 3 and 4 below present the Financial Settlement in both the Forward Market (FM) and the Day-Ahead Market (where the Physical Delivery of the forward transacted quantity takes place) for the Participants involved in the forward transaction. For simplicity, we present the corresponding profits and losses, only with regard to a random hour of the



first Delivery Day of July. Of course, we assume that the Clearing House intermediates in all Settlement procedures.

Case 1: The DAM clears at 40 €/MWh, both in the North and the South zone.

Participant A : $\{FM : (50 - 40) \in /MWh * 20 \ MWh = +200 \in \\ DAM : +40 \in /MWh * 20 \ MWh = +800 \in \\ MWh = +800 \in \\ FM : (40 - 50) \in /MWh * 20 \ MWh = -200 \in \\ DAM : -40 \in /MWh * 20 \ MWh = -800 \in \\ \end{bmatrix}$ Total : -1000 \in \\ Total : -10

Case 2: The DAM clears at 60 €/MWh, both in the North and the South zone.

Participant B : $\begin{cases}
FM: (60-50) €/MWh * 20 MWh = +200 € \\
DAM: -60 €/MWh * 20 MWh = -1200 €
\end{cases} Total: -1000€$

Case 3: The DAM clears at 40 €/MWh in the North zone and at 45 €/MWh in the South zone. The unconstrained System Marginal Price (i.e., the DAM SMP when the inter-zonal constraints are relaxed) is 42 €/MWh.

Case 4: The DAM clears at 55 €/MWh in the North zone and at 60 €/MWh in the South zone. The unconstrained System Marginal Price is 57.5 €/MWh.

It should be noted that no PUN Orders are present in the Greek Day-Ahead Market, so, in case of many Bidding Zones, even Load Representatives shall be cleared at the zonal market price (not at the production weighted average market price, as in Italy).



The hedging results as well as the "basis risk" of the Participants' participation in the Forward Market are revealed in this example.

In case a Seller is unable to allocate his NDP to his Entity(ies) due to technical unavailability (as submitted to and verified by the TSO through an Non-Availability Declaration and subsequently submitted to the Nomination Platform by the TSO), the Seller is able to buy this energy from the Day-Ahead Market in order to cover its Position and not to be imbalanced. The same applies for the Buyer who is able to correct his Physical Offtake Nomination Position by selling energy in the Day-Ahead Market.



9 Interface between the Trading Processes and the Clearing & Settlement Processes

This Chapter presents the main tasks performed by the Clearing House, the interface between the Market Operator and the Clearing House at the Trading Period and the interface between the Market Operator and the Clearing House at the Nominations.

9.1 Main tasks Performed by the Clearing House

The main responsibilities of the Clearing House with respect to the trading / clearing procedures are briefly presented in this Section.

Position administration / keeping

Transactions concluded on the Forward Market by Participants shall be recorded as positions in internal Position accounts by the Clearing House, according to its clearing rules.

Entries made by the Participants in the Trading Platform are binding for the Participant towards the Market Operator, as well as towards the Clearing House and their Clearing Members (e.g. banks). These include information about the Position account and the information whether it concerns an opening or closing trade.

The transactions concluded on the Trading Platform of the Market Operator shall be processed to the standard clearing processes for Forward Contracts.

Physical fulfillment and registration

The Clearing House is responsible for the Forward Contracts Registration Process of (a) the forward contracted energy quantities through the Exchange-Based Forward Market and (b) the Bilateral OTC Contracts.

Financial settlement and fulfillment

The Clearing House is responsible for the financial settlement and fulfillment of:

- a) Exchange-Based <u>Forward Contracts</u>: The contracted quantities in the Forward Market are financially (cash) settled only with the Variation Margins in the forward timeframe and the spot-referenced settlement procedure during the Delivery Period of each Forward Contract.
- b) <u>Bilateral OTC Contracts</u>: The Bilateral OTC Contracts are financially settled by the Clearing House, in order to efficiently handle the counterparty risk implied in such



contracts, something which shall underpin the liquidity of the bilaterally traded energy quantities.

✤ Margin requirements

As a central counterparty, the Clearing House shall assume the counterparty risk for all transactions concluded as Forward Contracts.

The Clearing House calculates an initial margin for all open positions in the Forward Market. On daily basis, the Clearing House adjusts the initial margin for every open position¹¹, and establishes the level of the collateral requirement (Margin Requirement) for the Clearing Members until 08:40 EET. The collateral must be furnished by every Clearing Member until 10:15 EET of the same day.

In the event of a default, the Clearing House guarantees payment and delivery (i.e. the Clearing House covers the settlement risk).

Enforcement of Position, Pre-Trade and Pre-Clearing Limits

The enforcement of such limits has been extensively described in Section 4.8.

Reporting services

The Clearing House shall provide Clearing, Settlement and financial fulfillment information to the Clearing Members and Non-Clearing Members (Participants) via the Clearing House electronic system after 10:00 EET on the next Business Day of the Trading Day.

9.2 Interface between the Market Operator and the Clearing House at the Trading Period

With respect to the trading schedule shown in Table 9-1, the interface between the Market Operator and the Clearing House is illustrated in Figure 9-1.

In general, the trading time of the Forward Market comprises three consecutive phases in each Forward Market Trading Day:

- A) the "pre-trading phase", from 08:30 EET until 10:30 EET;
- B) the "trading phase", from 10:30 EET until 15:30 EET; and
- C) the "post-trading phase", from 15:30 EET until 17:00 EET.

During the pre-trading period, Orders can be entered in the Trading Platform.

¹¹ In order to reflect the diversified risk in large portfolios the Clearing House shall recognize spreads between different products which reduce the margin requirement.


Upon the beginning of the trading phase, an opening auction is carried out and, afterwards, the Forward Contracts are traded continuously. After the end of the trading phase, the Trading Platform is still available for the Participants for entering and retrieving data (post-trading phase).

The Clearing House opening hours (Clearing Hours) are set from 08:30 EET to 17:00 EET on every Business Day.

It should be noted that Figure 9-1 has been designed to present a contractual relationship between a Non-Clearing Member (which is implied as a Participant here) and a Clearing Member, which is supposed to be a financial institution (e.g. a commercial bank) registered with the Clearing House in order to provide services to the Participants. The case that a Participant is a Clearing Member constitutes a simplification of the above contractual relationship, and the respective information exchange (as in Figure 9-1) is straightforward.

Trading and clearing processes			
08:30 D	Start of clearing hours.		
08:30 D	Daily Financial Settlement invoices of the previous Trading Day.		
08:30 D - 08:40 D	 Calculation of daily Margin Requirements by the Clearing House per Clearing Member. Calculation of daily Margin Requirements by each Clearing Member for the Non- Clearing Members. 		
09:00 D	Financial Settlement closed for the Variation Margins for the Open Positions during the previous Trading Day D-1.		
09:00 D	Daily notice from the Clearing House to Participants stating Clearing Transactions entered , "daily margin requirements" and other information regarding a Clearing Account.		
09:00 D – 10:15 D	Payment of cash collateral for the daily Margin Requirements from the Non-Clearing Members to the Clearing Members, and from the Clearing Members to the Clearing House.		
10:20 D	Information transfer from the Clearing House to the Market Operator, the Clearing Members and the Non-Clearing Members concerning the Pre- Trade Limits for active Participants, and the possible suspension of Participants due to Emergency Member Stop requests. Also information transfer from the Clearing House to the Clearing Members and the Non-Clearing Members concerning the Pre-Clearing Limits set by the Clearing House.		
10:30 D	Start of trading hours (continuous forward trading).		
10:30 D – 15:30 D	 Participants submit Orders to the Trading Platform The Market Operator through the Trading Platform validates the 		



	submitted Orders or sends a rejection notice to the involved Participants, in case Pre-Trade Limits are violated.		
	 The Market Operator cancels a trade, in case of activation of the consensual cancelation procedure asked by a Participant, or in case of activation of the obligatory cancelation procedure. 		
	4. The Clearing Members submit Trading Halts and requests for limitation of frequency of Orders' submission to the Clearing House.		
	 Upon receiving such requests as per (4) above, the Clearing House transfers the Trading Halts and requests for limitation of frequency of Orders' submission to the Market Operator. 		
	 Upon receiving such requests as per (4) above, the Clearing House proceeds to the inform the Market Operator and requests from the Market Operator to cancel the non-matched Orders of Participants submitted at the Trading Platform. 		
15:20 D - 15:30 D	Daily Settlement Price determined for each Forward Product.		
15:30	End of trading hours.		
15:30 D	The Market Operator through the Trading Platform informs the Clearing House concerning the concluded trades for all Participants, and the Daily Settlement Price per Forward Product.		
15:30 D – 17:00 D	 The Clearing House informs the Clearing Members and the Non- Clearing Members concerning the cancellation of concluded trades due to violation of pre-clearing limits, both for the concerned Participants and their counterparties 		
	2. Clearing process performed by the Clearing House		
	3. Calculation of Variation Margins performed by the Clearing House		
17:00 D	 The Clearing House informs the Clearing Members concerning the Variation Margins. 		
	2. The Clearing Members inform the Non-Clearing Members concerning the Variation Margins.		
17:00 D – 18:00 D	Report published by the Market Operator at its website, concerning the following information per Forward Market Trading Day:		
	A) the aggregated Sell and Buy Orders included in the Order Book;		
) the aggregated matched Sell and Buy Orders;		
	C) the Daily Settlement Price for each Forward Product;		
	 b) the total number and contracted energy quantity of cancelled trades by the Market Operator; 		
	 E) the total number of Trading Halts and requests for limitation of frequency of Orders' submission received and executed by the 		



	Market Operator;
	 F) the total number and the respective energy quantity of non-matched Orders submitted at the Trading Platform but cancelled by the Market Operator; and
	G) the total number of Participants trading (either with matched or non- matched Orders) in the Forward Market
17:05 D – 09:00 D+1	Financial Settlement for the Variation Margins (for the Trading Day D) takes place. The Participants must have at their disposal the necessary credit facilities for debit on their Clearing Accounts.
10:00 D+1 – 10:30 D+1	The Clearing House provides Clearing, Settlement and financial fulfillment information to the Clearing Members and Non-Clearing Members via the Clearing House electronic system.

Table 9-1: Trading and Clearing processes

9.3 Interface between the Market Operator and the Clearing House during the Forward Contracts Registration Process

The interface between the Market Operator and the Clearing House during the Forward Contracts Registration process for Delivery Day D is illustrated in Figure 9-2. It should be noted that there is no information exchange between the Clearing House and the Market Operator within the frame of the Physical Delivery/Offtake Nomination process, but we present this process in Figure 8-2 for completeness reasons.





Figure 9-1: Basic timeline and information exchange concerning the trading processes (timing is in EET in this Figure)



calendar day D-2	calendar day D-1	Calendar day D
10 17 ⁰⁰ 0 Forward Contracts Registration Gate Closure Time	0 ⁰⁰ 09 ⁰⁰ -09 ³⁰ 10 ⁰⁰ 10 ³⁰ LT PTRs Nomination Physical Delivery Gate Closure Time Nomination Gate Closure Time	op ^{on} op Participants
LT PTR nomini import per interco	Non-Availability Declarations by Producers and RES Producer nnection	submission of hysical Delivery / ftake ominations TSO
LT PTI nomin impor per interc	S Physical Delivery ts/exports Physical Offtake Nominations and Physical Offtake Nominations basis	
4 check	s Pr	rocesses Market Operator
Forward Contracts Registration per Participant for the Forward Market Contracts and the Bilateral OTC Contracts	Subi Price at th forw ener	nit Priority e-Taking Orders le DAM for the ard contracted gy quantities
•		Clearing House

Figure 9-2: Basic timeline and information exchange concerning the Nomination Platform processes (timing is in EET in this Figure)



10 Maximum Percentage of Forward Contracts

10.1 Introduction

According to Article 14 paragraph 6 of Law 4425/2016, in order to secure the liquidity of the Day-Ahead Market (and the price discovery process), a maximum percentage of forward contracted quantities to cover a demand portfolio can be imposed to Load Representatives with significant retail market shares. This provision is crucial in order to secure the smooth transition of the current market structure to a market where more Participants are vertically-integrated and participate with significant portfolios in the wholesale and retail market in Greece.

This rule shall be applied for a transitory period, and can be relaxed over time if the market conditions change. A roadmap shall be constructed by the Regulator indicating the status of the market or in other terms the pre-conditions under which these decisions will be taken/activated.

This rule will not allow the incumbent to clear most of its load requirements with Forward Contracts, for example clear with Forward Contracts 80% or 90% of its represented demand, and bid only for the remaining load in the Day-Ahead Market. If such constraint is not applied, the price discovery process may be compromised since:

- > The liquidity of the Day-Ahead Market would be significantly constrained, and
- > The attained market prices would not express the short-term marginal cost of the electricity produced.

The above rule shall be imposed to the incumbent and all Load Representatives that gradually attain a market share of end-consumption higher than a threshold X% and the energy quantities included in the validated Physical Offtake Nominations are above A% of the total purchased energy quantities from the accepted Buy Orders in the Day-Ahead Market. The values of X% and A% shall be decoded on annual basis by the Regulator.

A detailed analysis of this market rule is presented in the reports associated with the LOT 3 part of this project.

10.2 Computation of Maximum Threshold per Load Representative

In *Chapter 7,* the submission of Physical Offtake Nominations (to the Nomination Platform) has been described by Load Representatives for each Delivery Hour of each Delivery Day D. The sum of Physical Offtake Nominations over all Bidding Zones *z* shall serve as the



basis for the compliance check with the maximum percentage of forward contracted quantities of Load Representatives (demand side constraint).

The compliance check shall be applied on each day D-1 (for the energy schedules of Delivery Day D) after the DAM clearing (ex-post check), namely until 16:00 EET of day D-1 with regard to each Market Time Unit of Delivery Day D, based on the sum of Physical Offtake Nominations of said Load Representative p and the cleared buying quantities that have resulted from the Load Representative's bidding in the DAM. In this case, the compliance check shall be:

$$\frac{\sum_{z} PON_{z,p,t}}{\sum_{z} \left(PON_{z,p,t} + Y_{z,p,t} \right)} \le A\% \qquad \forall t \in Trading Day D, p \in Load Representatives$$

where:

 $PON_{z,p,t}$ the Physical Offtake Nomination submitted by Load Representative *p* for Market Time Unit *t* of the Delivery Day D in Bidding Zone *z*,

 $Y_{z,p,t}$ the accepted energy quantities of the Load Representative *p* in the Day-Ahead Market for Market Time Unit *t* of the Delivery Day D.

A% the applicable maximum threshold of the above-mentioned constraint.

10.3 Penalties for Non-Compliance

Penalties for each Market Time Unit shall be imposed to the Load Representatives that do not comply with the criterion, with regard to the quantities that exceed the maximum threshold defined in the previous paragraph, and only for the Market Time Units that the above ratio overcomes the maximum threshold. The penalties should be high enough to avert the Load Representatives from employing strategic gaming with this constraint. The non-compliance charge is calculated for Market Time Unit *t* of the Delivery Day as follows:

$$NCC_{p,t} = \max\left(\left[\sum_{z} PON_{z,p,t} - A\% \cdot \sum_{z} \left(PON_{z,p,t} + Y_{z,p,t}\right)\right] \cdot CAP , 0\right)$$

where:

CAP the Administratively Defined DAM Orders Upper Limit.