



ENERGY COOPERATION BETWEEN THE EU, THE LITTORAL STATES OF THE BLACK & CASPIAN SEAS AND THEIR NEIGHBOURING COUNTRIES



**Ad Hoc Expert Facility**

**under the INOGATE project**

**“Support to Energy Market Integration and Sustainable Energy in  
the NIS” (SEMISE)**

**Recommendations in the  
implementation of electricity market  
model**

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# **1 INTRODUCTION**

This report defines the best practises from Europe taking into consideration the local conditions of Ukraine to create a roadmap for the new Ukrainian market. The model could be applied to other countries restructuring their electricity markets.

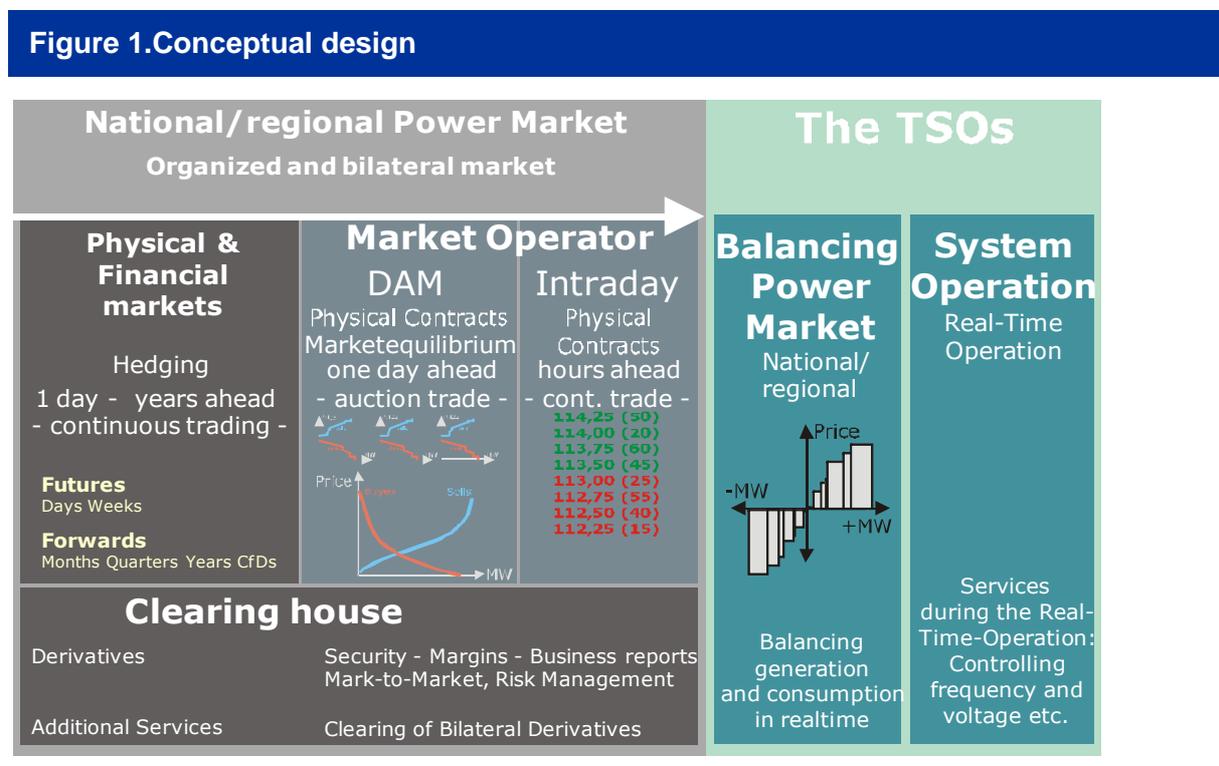
## 2 GENERAL STRUCTURE OF THE MARKET MODEL

Recommendations for the general structure for the market model are based on the Energy Community Wholesale market design that is based on the best practise from Europe.

### 2.1 CONCEPTUAL MARKET DESIGN

Deregulation of the wholesale electricity market aims at increasing efficiency and promotes investments in the power business in Ukraine. Integration with other European power markets will be to the long term benefit of the country. Hence, a wholesale market design that facilitates such integration has been a prerequisite for the Consultant when developing the proposed market design.

Figure 1 illustrates the recommended conceptual design.



The basic structure of the proposed market design is:

1. Day Ahead Markets (DAM) combined with bilateral trading and physical forwards organized in Ukraine
2. Implicit auction of cross border capacity within Ukraine (if congested) and with the neighbouring countries.
3. Balancing responsibility for wholesale market participants. This will provide the market participants an incentive to trade into balance before entering real-time operations
4. Separation between grid and energy costs
5. Real Time Balancing Market/Ancillary /Reserve markets are vital to ensure balance management. The DAM is the most important balancing tool for the TSO and to have an efficient DAM is also dependent on the balancing market operation

6. Transparent Market Data
7. Market Surveillance
8. Intraday Market, to support better balance management (next step)
9. Capacity Reserve Market (next step)
10. Financial Electricity Market, organized and bilateral (next step)

During the initial phase of the wholesale market opening efforts should be focused on the first seven points.

This market concept will offer a number of advantages as it will expose wholesale market participants to market prices on parts of their volumes from day one of market opening and thus provide for market liquidity from the start. This is explained in details in chapter 2.3.

- Establishing a reference price for electricity
- Established merit order in price setting and thereby incentivise enhanced efficiency within generation;
- Improved utilization of cross border transmission capacities; hourly aligning cross border flows in the direction low to high area prices (in case of congestion)
- Alleviating grids during peak hours through reduced withdrawal of flexible loads
- Market price signals to be used for system (generation and transmission) expansion planning

#### **Important market design elements:**

- Staged implementation of a wholesale market with respect to both national and cross border trading
- A Market Operator should set up physical forward markets with local Incumbents as market makers to give the participants the opportunity to buy longer term contracts.
- Introduce transitional incentives for eligible consumers and public suppliers to source from the open market to promote and secure market liquidity. During the transitional period, volumes at a regulated and favourable price will be gradually reduced. The local authorities must decide on the duration of the transitional period. As the success of this design depends entirely upon sufficient volumes nominated at DAM (liquidity), political support is strongly recommended to
  - Incentivize eligible customers to nominate volumes at DAM
  - Ensure that public suppliers purchase parts of tariff customers' consumption from DAM
  - Make TSO purchase main grid losses from DAM

Eligible customers can be encouraged to trade at DAM in different ways.

  - A market that allow eligible customers to stay under regulated prices can negotiate special base load contracts – with reduced volumes year by year - for eligible customers if they accept to take the remaining volumes from DAM. In this way eligible customers will have predictability over the transitional period
  - A market that have decided to exclude eligible customers from tariff prices, but experience that competition is not working - might as well offer base load contracts to eligible customers given that they take remaining volumes from DAM.

The most important decision to secure DAM volumes will be to cancel full supply contracts between incumbents and public suppliers serving tariff customers. Full

supply contracts prevent volumes to come to the market. They should be replaced by base load contracts covering a certain share of tariff customers' yearly energy consumption. Volumes will be reduced year by year based on political considerations. The remaining part of tariff customers' load should be purchased by public suppliers from DAM

- Creating a fundament for joining a regional wholesale electricity market founded on a Day-Ahead Market (DAM) where the national DAMs are linked together through implicit auction
- Promote competition between organized markets and bilateral trade
- Ownership and governance of market entities
- Provide support for favourable tariffs to vulnerable customers
- Enhancement in the investment climate for new generation and/or grid. A open wholesale market linking to a pan European electricity market, will secure the investors transparency in market data and confidence in market prices
- Flexibility through hourly DAM products for market participants

A Generator will, through his access to DAM, at any time have incentive to reduce his production if DAM offers cheaper power. Consumers with flexible load will in the same way have incentive to reduce marginal demand (controllable load) during periods with very high prices. In this way all generation, consumption and transmission will "adapt" to market prices in the country (and in the future) the SEE region based on bid/offers of marginal volumes in the open market

## 2.2 INTEGRATION WITH NEIGHBOURING MARKETS

A liquid Ukrainian(Moldavian, Georgian, Armenian, etc.) wholesale market coupled to other European power markets with the same trading regimes will soon establish a reliable and trustworthy price reference for the region and attract investors.

Implicit auctions can link Ukraine to South EastEuropean DAMs and to other neighbouring DAMs. Transitional solutions with reservation of minor cross border capacities for explicit auctions might be required.

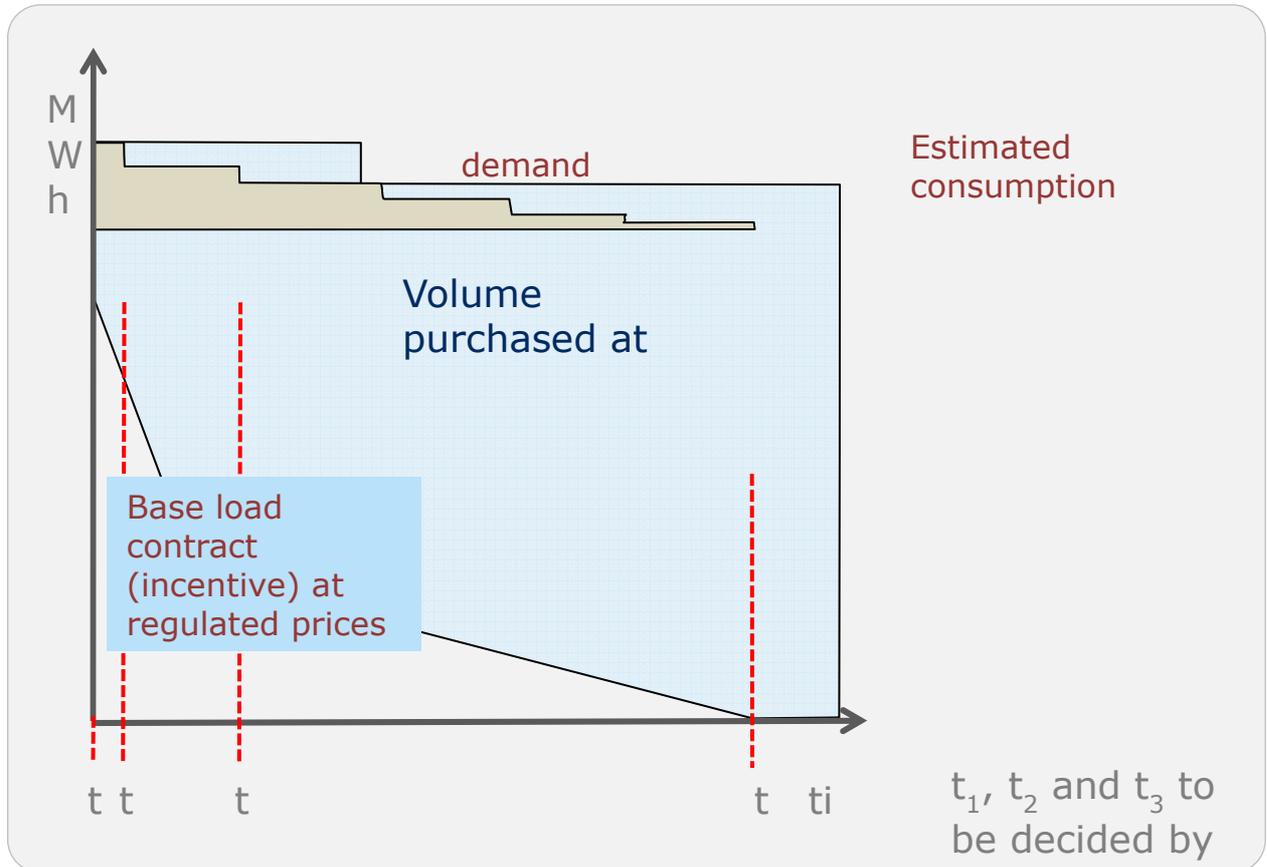
Integration of European spot power markets made a big step forward when the power exchanges APX-Endex, Belpex, EPEX Spot, GME, Nord Pool Spot, and OMEL March 18<sup>th</sup>2010 announced the creation of a six party project aimed at delivering a single price coupling across the Nordic, Central West and Southern European regions, potentially as early as next year. The Price Coupling of Regions (PCR) project will address the implementation of a common price coupling solution through which spot electricity price formation will be coordinated in an area potentially covering approximately 2,900 TWh per year of power consumption. The initiative is open to other power exchanges and market areas joining on fair and equal terms and represents a development towards a truly integrated European spot market for electricity.

## 2.3 TRANSITION PHASE: FROM REGULATED PRICES TO MARKET PRICES

Exposing eligible customers fully to real market prices from day one of the wholesale market opening process will meet hindrance due to uncertain market prices and their volatility. For this reason transitional schemes must be considered.

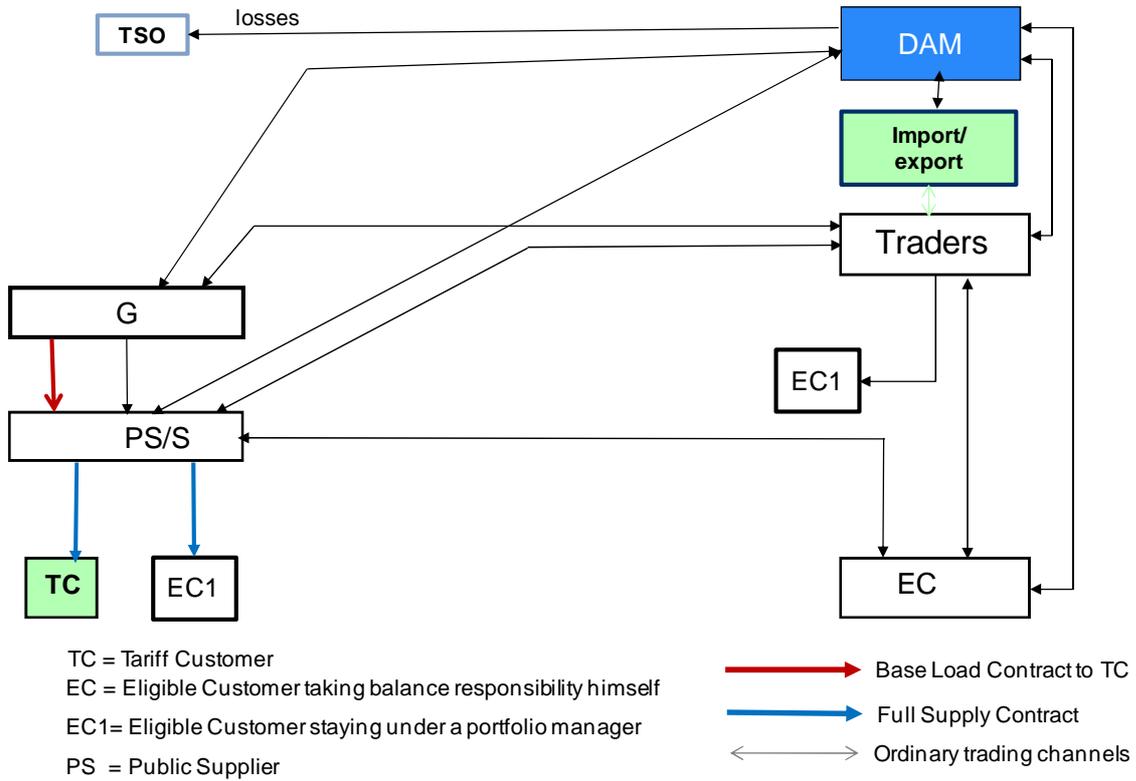
In general a transition period with steadily decreasing contract volumes supplied at regulated prices is recommended to gain acceptance among market participants. This solution is illustrated in the figure below.

**Figure 2 Transitional period – market and regulated prices – Eligible Consumers**



The following figures illustrate how this design works.

**Figure 3 Recommended transitional design**



Bilateral trade will focus on mid- and long term agreements while DAM will offer market participants an instrument to fine-tune their hourly supply/demand balance (contract portfolio).

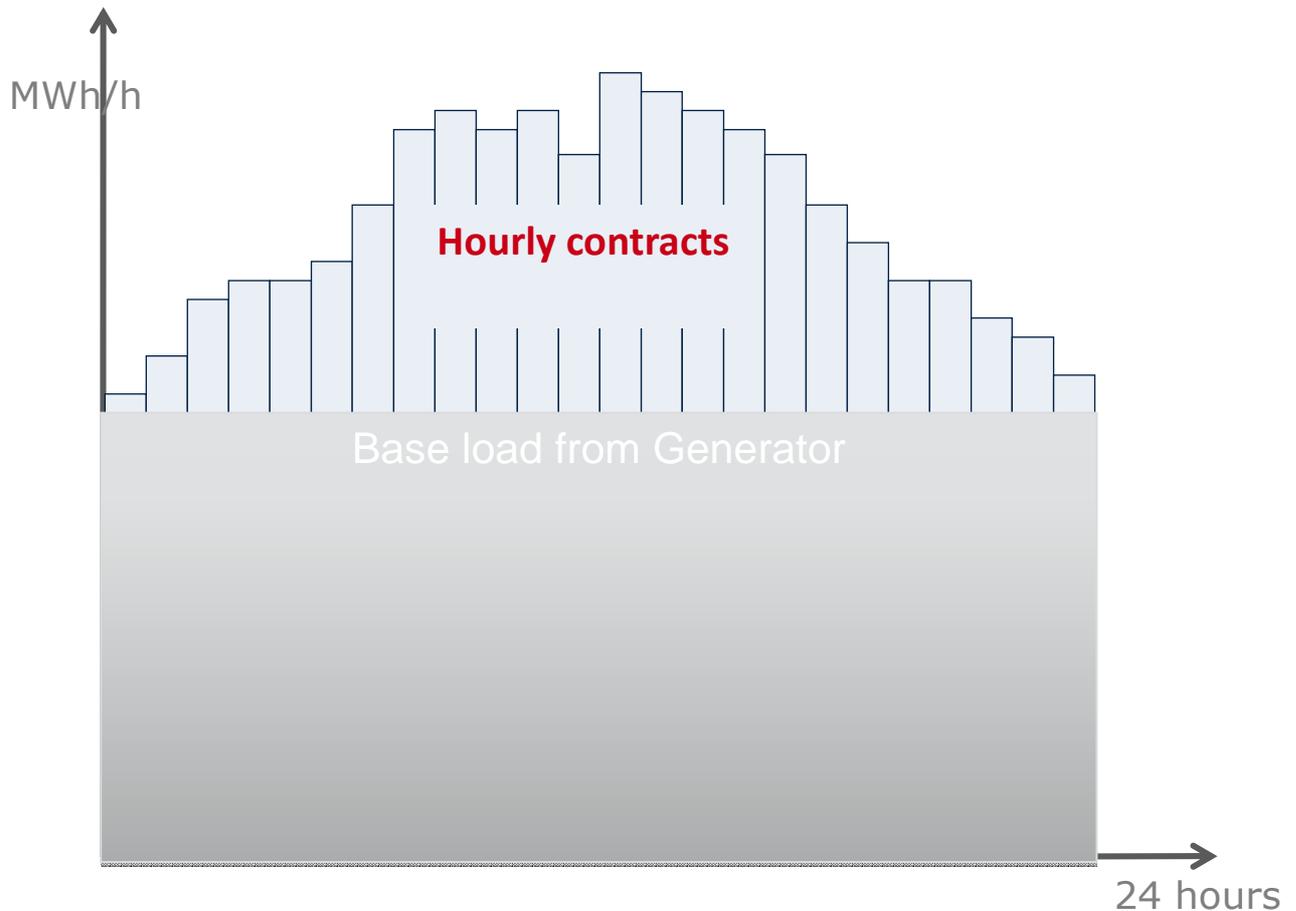
If incentives are necessary to motivate eligible customers to exercise their eligibility from day one of market opening, base load contracts with Generators – declining over time - can be a solution, in line with the arrangement proposed for serving tariff customers.

In order to increase liquidity, TSOs should buy grid losses from DAM.

A simple contract portfolio for a Public Supplier serving Tariff Customers is shown below. Here you will see a base load contract between Public Supplier and Generators (incumbents), to represent the old tariff and hourly contracts from DAM filling the gap (i.e. additional required volumes) between the base load contract and estimated consumption.

The Public Supplier should be allowed mechanisms in his pricing to his customers to reflect the market prices to avoid setting Public Supplier at risks.

**Figure 4 Public Supplier with trading portfolio for Tariff Customers**



Traders, Eligible Customers and Suppliers will in general have a more complex contract portfolio, established over time in order to minimize cost, but the principles are the same. Hourly contracts from DAM fill the gap between contracted volumes and estimated load. They “trade into balance”.

Deviations from expected load will be handled on the imbalance market – or later when implemented – on the intraday market. The structure of such a contract portfolio is illustrated below.

**Figure 5 Trading portfolio for Eligible Consumers & Suppliers**



Generators, Suppliers and Eligible Customers will in this way be exposed to market prices on marginal volumes, increasing over time as volumes for eligible customers and tariff customers are scaled down. These volumes, together with export/import volumes will give DAM liquidity. Market prices will therefore be established from day one of market opening with sufficient liquidity.

## 2.4 VPP AUCTIONS, AUCTIONS OF BILATERAL CONTRACTS AND PHYSICAL FORWARD MARKETS ARRANGED BY THE LOCAL MARKET OPERATOR

A VPP (Virtual Power Plant) auction is a mandatory auction of generation capacity in order to mitigate incumbents' dominant market position. The buyer gets a contract (base or peak) at auction price, but the owner of the VPP operates the plant independently of how the buyer nominates capacity from the plant.

The proposed market solution implies that incumbents serve tariff customers through a base load contract with the public suppliers.

Such a contract reduces incumbents' dominant market position in the same way as VPP auctions. The only difference is that prices are set differently.

For this reason, the Consultant does not see the need for VPP auctions from day one of market opening. VPP auctions might be considered later when downsizing of volumes for tariff customers has "strengthened" incumbents' potential dominant market position.

VPP Auctions serve however other important missions: They bring transparency to the forward market and reduce market power.

A market based solution which combines transparency and (minimum) liquidity is much to prefer rather than mandatory schemes. The Consultant recommends a solution in the Ukrainian market operator set up physical forward markets within their jurisdictions with local Incumbents as market makers. This should be based on standardized contracts and having the market operator being a central counterparty to all trades.

Physical forward markets will soon be changed into financial forwards as this is a much more flexible solution. This process will be driven by market participants.

## 2.5 ADDITIONAL REQUIREMENTS

A successful wholesale market opening depends upon engagements and commitments from authorities, market operators and market participants. All stakeholders have to recognize that deregulation of the electricity sector will bring benefits to the region through increased efficiency, enhanced security of supply and climate for investment.

The market concept facilitates a quick integration of Ukraine into the European power markets. A number of changes and decisions are required for a smooth transition from the current situation to full integration. These requirements are based upon identified barriers such as:

- No real reference price for energy
- Insufficient unbundling of supply/generation
- Deficient eligibility management
- Missing systems for imbalance handling
- High market concentration
- Lack of transparency

To overcome these barriers and secure liquidity in the market place from the start-up some decisions are recommended:

- Cancellation of incumbent Generators' commitment to serve tariff customers. A split of responsibility Incumbents provide public suppliers with base load contracts partly covering tariff customers' demand. Contract volumes to be reduced year by year according to a plan approved by local authorities.
  - Public suppliers purchase remaining volumes from the DAM.
- Incentives for eligible customers to source from DAM. Such incentives bring predictability and prepare the customers for full market exposure.
- Mandatory for wholesale market participants to be balance responsible parties – either directly or through traders etc.
- Cross border capacity allocated to DAM. In a transitional period it might be necessary to execute congestion management by both implicit and explicit auctions. This can be facilitated by allocating a fixed percentage of cross border capacities, e.g. 50%, to the Power Market for implicit auction, and an equal part for monthly and yearly explicit auctions.
- VPP (Virtual Power Plants) – auction of generation capacity, volumes decided by the authorities - should be considered if competition is not working satisfactory after market opening. If incentives to trade, as recommended in previous chapters are implemented, VPP auctions will probably be redundant.
- TSOs to purchase main grid losses at the DAM

The following are overall requirements applicable to any wholesale electricity market reform:

- All participants trade on equal terms, i.e.that they follow a common book of rules
- Market transparency providing the same information at the same time to all participants
- Efficient market settlement and reporting
- Market surveillance

## 2.6 GENERAL RECOMMENDATIONS

In the following sections, the recommendation for the Ukrainian market is set out. These recommendations are founded on the requirements set out in the previous chapter and based on the general design features defined further in this chapter.

### *Main Characteristics*

The Consultant's main recommendation for the Ukrainian Market Design can be summarized in the following four points.

- Zonal pricing and implicit auction open for price coupling with neighbouring countries/regions;
- Trading platforms (software) for:
  - Initial markets:
    - Day-Ahead Market(DAM),
    - Balancing Market(BM),
    - Physical Forward Market(PFM)
  - Future markets:
    - Intra-Day Market(IDM),

- Virtual Power Plant Auctions(VPPA),
  - Financial Forward Market (FFM).
- Ownership in the first 3-5 years of operation is exclusively for the TSO

In the first few years of operations after the implementation of a market platform, the trade of physical products will be the focal point. These mostly short term products, especially day-ahead, cross-border capacities for DAM and balancing power, are crucial for the TSOs' management of security supply issues. It is therefore strongly recommended that the TSO has an exclusive ownership the local market operator.

In the case, services are bought from an existing provider; the TSOs must be the contract counterpart either directly or via its local market operator.

At a later stage when the launch of financial electricity contracts takes place, it may be advantageous to introduce additional owners in the regional service provider, e.g. banks and other financial institutions

- All TSOs participate from day one in the implementation of the competitive regional market

Ownership and full commitment by TSOs from day one, is the single most important prerequisite for enabling the establishment of a well-functioning competitive electricity market in the SEE region.

## 2.7 ROLES AND RESPONSIBILITIES

For the operation of a restructured power market, the following two key organizations should work very closely together.

They are identified as:

- The TSO
- Market operator

These two organizations will have clearly defined roles and responsibilities along with:

- Power industry regulators;
- Market participants (power generators, power consumers, traders);
- DSOs.

The roles and responsibilities for each of these are described below.

### TSO

As a monopoly the grid owner's performance and business processes must be monitored by the regulatory bodies.

The TSOs' responsibilities as owner of the transmission grid are:

- Determine rules and requirements for supply quality and security
- Provide routines to maintain short term power reserves
- Propose transmission tariffs for the main grid

- Manage real time operations and handle unpredictable imbalances and unexpected events
- Operator of the Balancing market, Ancillary Services market as well as other required markets/mechanism to ensure an efficient balance management.
- Cooperate with TSOs of interconnected grids
- Manage transmission capacity on the neighbouring interconnections
- Manage imbalance settlement and billing
- Build, operate and maintain the grid within its defined area
- Collect and report metered values
- Purchase electricity to cover grid losses
- Have ownership in market operator (for DAM)

The TSOs play a very important role in deregulated power markets. The TSOs' responsibility to operate, maintain the reliability and quality of the power supply will always set the daily framework for the market operations.

#### *Market Operator - DAM*

A license or cooperation agreement to operate the DAM under the framework set by the regulator.

The core responsibilities are:

- Operate a Day Ahead Market based on an implicit auction and the market splitting principle. In the future it could also provide services for other related power markets
- Provide reference price(s) for energy
- Use the price mechanisms to alleviate grid congestion through optimal use of available transmission capacity in the case of congestion
- Act as a reliable counterpart
- Report to TSOs, participants and to the public required information and data

A market operator will always facilitate trade, the transparent handling of price sensitive information, support market competition and build market liquidity.

#### *Regulator*

The Regulator determines guidelines and bylaws for the regulation of monopolies within the power market.

This will cover issues such as inter alia:

- Market design and market rules
- Harmonisation, definition and approval of guidelines for
  - power system operation
  - metering
  - grid tariffs
  - etc
- Responsible for licensing of TSO, market operator and other required licensees.

- Monitoring monopolies like grid owners and market operator, costs and profits
- Provide incentives for eligible customers to exercise eligibility.
- Responsibility of Market Monitoring and Market Surveillance both on a local and regional level.
- Create monitoring regime for the market(s) operated by TSO and DAM operator. The market surveillance can be outsourced as a department of the TSO and/or market operator.

Regulator authorities' responsibility for guidelines, standards and regulations of the local power system and the power market remains unchanged.

### *Incumbent producer*

Large dominant producers will be important participants in the market. They will normally secure their position and further develop their competitive ability inter regionally. An important prerequisite is full competition with respect to allocation procedures of cross-border capacities so that both incumbent and new entrants in generation have equal access to transmission.

### *Market Participants*

Market Participants are legal entities that operate in the wholesale and/or retail markets. They can play multiple roles consisting of one or a combination of the following: generator, consumer (eligible and large industries), trader, or retailer.

### *DSOs*

The DSOs will be responsible for measurement within each DSOs distribution area. Metering values for wholesale market participants connected to the DSOs grid have to be sent to the TSO for balance settlement.

## 2.8 GRID TARIFFS

The preferred grid tariff system to facilitate bilateral trade or trade in a power market should be characterized by principles that treat all participants on equal terms.

Most important features will be:

- Market participants should know the transmission costs at their grid connection point by a tariff set by the grid owner or system operator.
- No bilateral negotiations and agreements should be required.
- Transmission cost should not be dependent on location of a trade counterpart.

## 2.9 LEGAL REQUIREMENTS

### *2.9.1 Operational agreements*

A key element for the successful launch and operation of the Ukrainian energy market is to have the required set of Operational agreements.

**Participant agreement:** The Participant agreement between the market operator and DAM participants give permit to trade in DAM. The Agreement also includes sub-agreements for handling of credit cover/collaterals to the market operator, bidding rules, rules for price

determination, market information (transparency), ethical guidelines and data reporting/collection,

**MO-TSO agreement:** This is mainly covering information sharing and interfaces/timing in this regard. It will also include that the MO operation will be compliant with the Grid and Transmissions Codes.

**Balance agreements:** This is the agreements between the TSO and the balance responsible parties. This will cover the rules for how the balance responsibility will be performed and the requirements for these participants

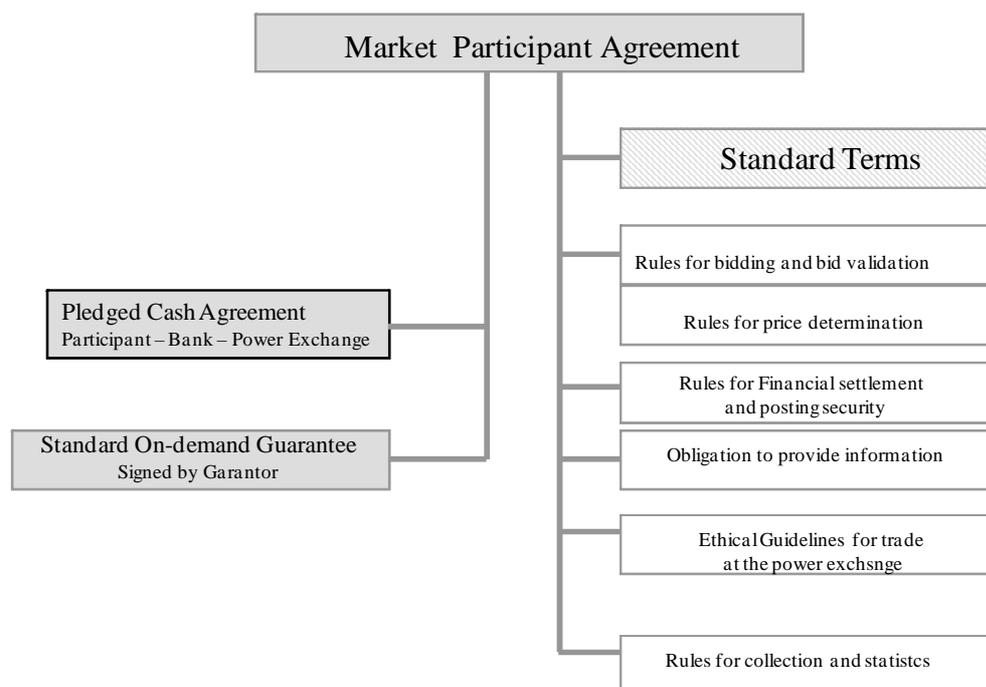
**Special agreement for capacity/reserves:** These are the agreements covering the bilateral arrangements required by the TSO to secure a stable system operation in addition to the market framework.

**Connection agreement:** This is the agreement between the TSO and the market participants regulating their grid connection and metering requirements.

### 2.9.2 Market participant agreement

The Market participant agreement structure could be like this (taken from the Nord Pool market)

**Figure 7 Market participant agreement**



## 2.10 PRODUCT STRUCTURE

The following products are normally defined in a DAM:

- Single bid
- Block bid (future)
- Flexible bid (future)

In a second phase of the DAM market development, the trade in forward products should be offered. This can be physical contracts initially, and at later stage financial contracts using the DAM market clearing price as reference price.

Bids are not related to any specific physical resource. All bids are related to a defined bidding area by a defined trading hub. All bids have the same priority. This is known as portfolio bidding.

The single bid must be monotonously increasing. Each price must be higher than the previous price. The first bid price must be equal to the minimum price limit, and the last bid price must be equal to the maximum price limit.

The block bid for sale or purchase shall contain the same quantity for several hours. The sale bid will contain a price that indicates that if the average market price over the period (block) is lower than this level, the bid is not accepted. The purchase bid will contain a price that indicates the maximum price the purchaser is willing to pay. If the average market price in the period (block) is higher than this price, the bid is not accepted.

The flexible bid is relevant in potential peak-load hours, where power shortages cause high prices. Flexible bids are available for power sales only. Flexible bids consist of a price and a volume; hour is not specified in the bid. The price indicates the lowest sell price, and if any hourly market price exceeds the bid price, the flexible bid will be accepted in the hour with highest price.

## 2.11 USEFUL LINKS

Here are some useful links:

*General information of the physical markets in the Nordics:*

Market operator: [www.nordpoolspot.com](http://www.nordpoolspot.com)

TSO: [www.statnett.no](http://www.statnett.no)

*Market participant agreement:*

<http://www.nordpoolspot.com/TAS/Day-ahead-market-Elspot/Rulebook-for-the-Physical-Markets/>

*Price setting at DAM*

<http://www.nordpoolspot.com/How-does-it-work/Day-ahead-market-Elspot-/Price-calculation/>