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# **Ancillary Services and Balancing in the Wholesale Market of Bosnia-Herzegovina Presentation by DNV KEMA**

**August 2013**

Bosnia and Herzegovina (BiH) Regulatory and Energy Assistance Project (REAP)  
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# **Proposed Solutions for Improving Balancing Services Provision in BiH**



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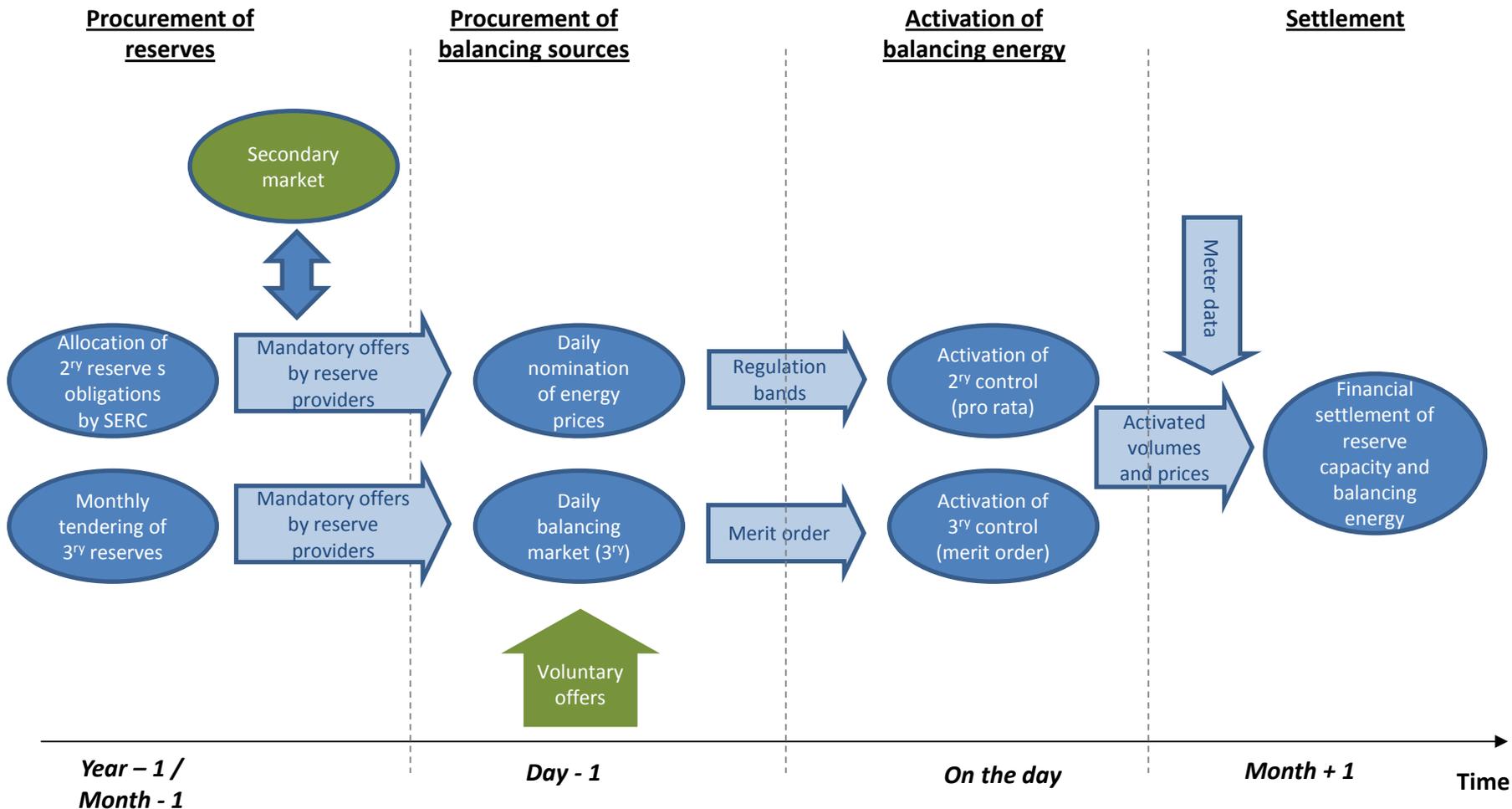
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## **Areas to be considered**

- A. Procurement of reserves (secondary and tertiary control)**
- B. Real time balancing (secondary and tertiary control)**
- C. Metering and pricing of BRP imbalances**
- D. Financial Settlement**
  
- E. Summary**
- F. Next steps and required institutional changes**



## Overview





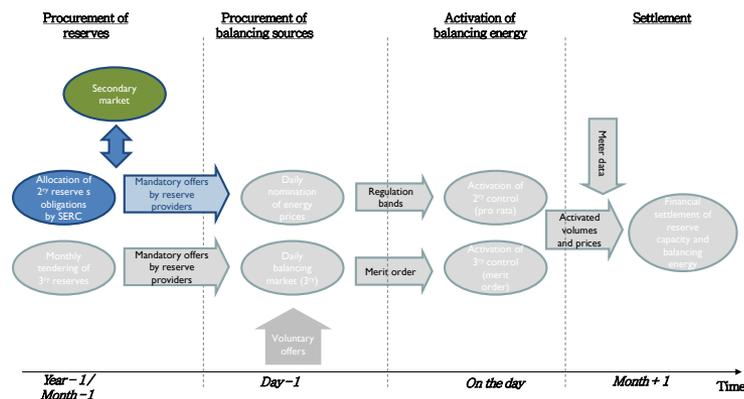
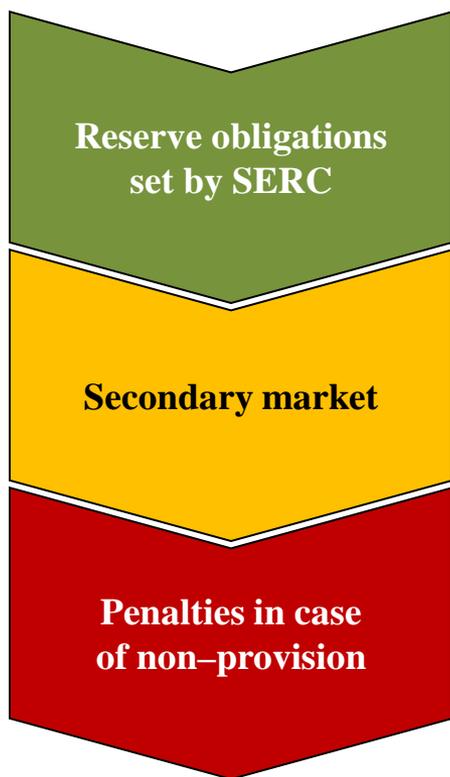
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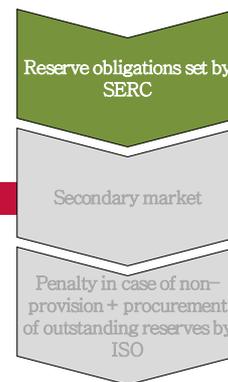
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# **Procurement of reserves (secondary and tertiary control)**



# Procurement of secondary reserves – Overview

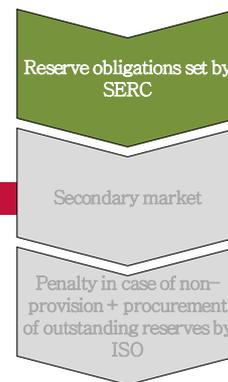




# Procurement of secondary reserves – Phase I: Reserve obligations set by SERC

## I. Procurement mechanism

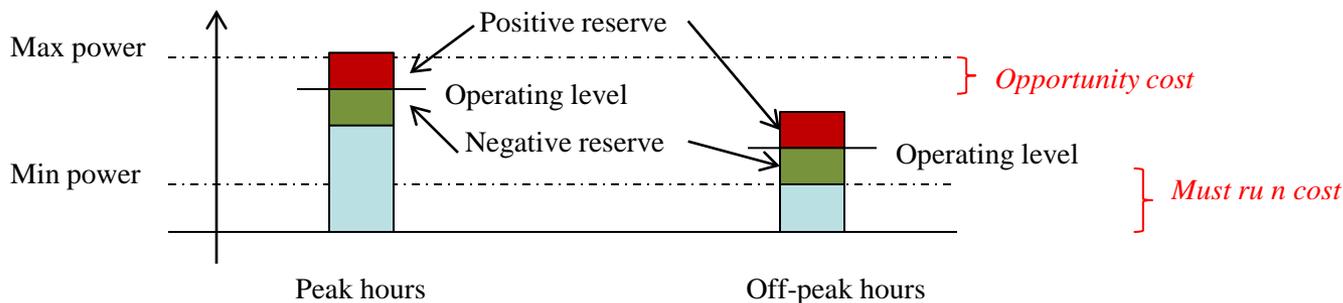
- SERC sets reserve requirements for BSPs (based on ISO proposal)
- Each party's share equivalent to the share of its need relative to total BiH need (as for allocation of secondary reserve cost today)
- Allocation based on portfolio basis, i.e. BSP is free to decide which units will provide reserve subject to availability, technical capability and economic optimisation
- Product structure
  - Distinct reserve requirements to be determined by SERC / ISO for three different time slots:
    - Peak hours on working days
    - Off –peak hours on working days
    - Weekends and holidays
  - Responds to different reserve needs



## Procurement of secondary reserves – Phase I: Reserve obligations set by SERC

### 2. Pricing

- Producers receive regulated payment for ancillary services (as today)
- *Required incentive : Regulated Price  $\geq$  Max {Capital cost (as today) ; operation cost}*
- *Operation cost = Opportunity cost, i.e. non-realised gains from alternative use of power retained from reserve provision, or must-run cost necessary provision*
- For hydro storage plants the operation cost is a function of the 'water value', i.e. the value of electricity that can be produced with the water stored either today or later
- As water value varies by time, also the price for secondary reserve should vary by time (approximation by three sub-products)
- In the absence of a wholesale market price, a foreign price index should be taken as reference which best reflects structural incentives for the provision of secondary reserve

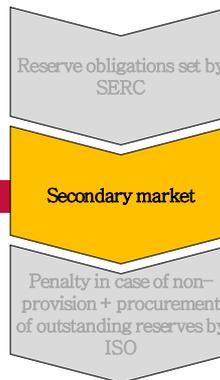




# Procurement of secondary reserves – Phase II: Secondary Market

## I. Procurement mechanism

- Complementary to initial reserve allocation
- Voluntary trading of reserve requirements between BSPs (certain share of BSP's reserve requirement during certain hours /days, separately for different time slots)
  - Buying party, i.e. BSP which assumes additional reserve requirements from other BSP, is responsible for proper reserve provision
- Reasons to participate may be:
  - Technical unavailability of own sources or economic disadvantages when providing from own sources („buyer“)
  - Additional income from additional reserve provision („seller“)
- Enables shift of reserve provision from more to less expensive sources → economic efficiency
- Commercial terms and conditions of reserve “transactions” will remain subject to bilateral negotiation between the EPs
- No additional cost for consumers, i.e. they pay the original (regulated) tariff
- No involvement of ISO, but ISO needs to be informed about confirmed transactions



# Procurement of secondary reserves – Phase II: Secondary Market

## 2. Pricing

- Free pricing among BSPs, to enhance willingness to provide additional volumes and limit strategic behaviour to rely on ISO as ‚fall-back option‘
- Clear incentive on BSPs to purchase missing volumes:
  - Missing volumes will be bought by ISO (where possible), at a price that is higher than the „normal“ regulated price for secondary control reserves
  - BSP will have to pay cost of reserve purchase by the ISO, plus additional penalty for failing to comply with its reserve obligations (see below)



# Procurement of secondary reserves – Phase III: Penalty in case of non-provision + procurement of outstanding reserves by ISO

## I. Penalty for non-provision

- Set by SERC
- Should be set high enough to be a severe penalty which incentivises BSPs not rely on the fall back option but make bilateral arrangements with other BSPs in the secondary market



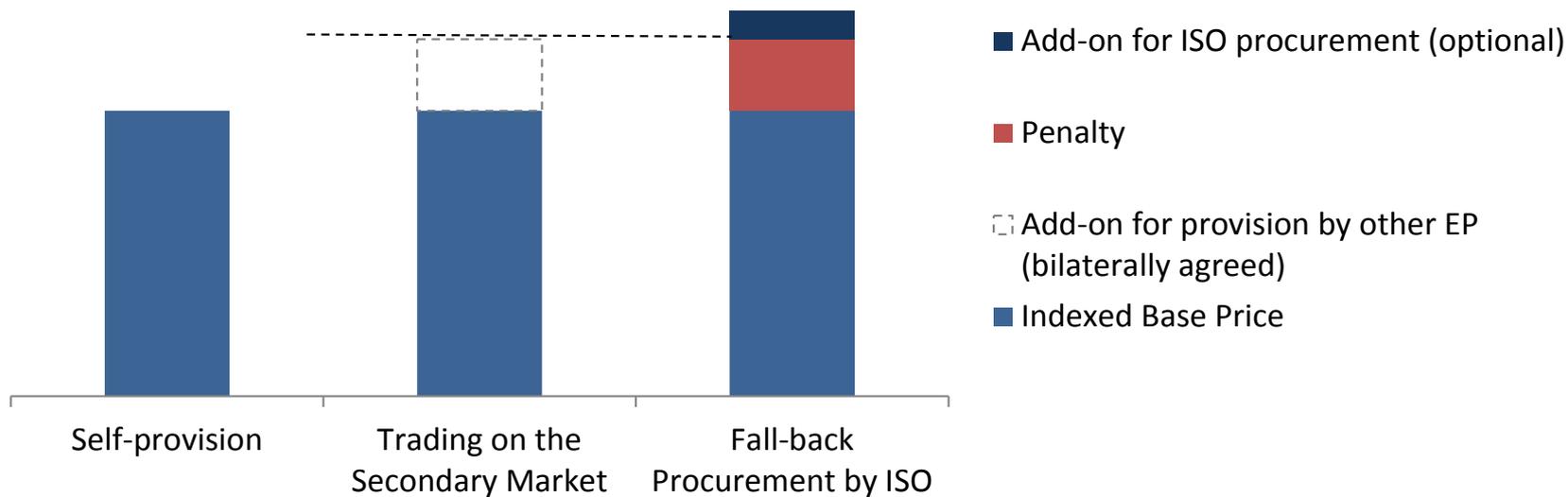
# Procurement of secondary reserves – Phase III: Penalty in case of non-provision + procurement of outstanding reserves by ISO

## 2. Procurement of outstanding reserves by ISO

- Only fall-back option: ISO as ‘last resort supplier’ of outstanding reserves
- ISO should try to find domestic sources in BiH first before trying to procure abroad
- BSP in breach of its reserve obligation must bear the cost of reserve procurement incurred by ISO plus a (regulated) penalty for non-provision  
=> provides strong incentive for BSPs to meet their reserve obligation from own sources and by secondary market trades



# Procurement of secondary reserves – Pricing overview





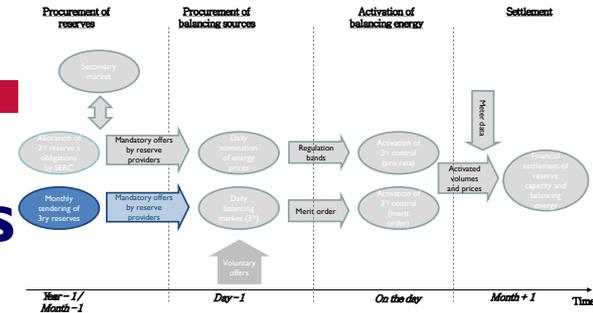
## Procurement of tertiary reserves

### I. Procurement mechanism

- Public tenders (free market bidding )
- Similar product structure as for secondary reserve
- Limited to upward regulation (as today)
- ISO selects most economic bids
- Severe penalty for non-provision
- Cost may change every monthly and may therefore be hardly anticipated
  - Ex ante determination of ancillary services tariff difficult
  - Requires ex post settlement of cost deviations

### 2. Pricing

- No pricing restrictions (to incentivise BSPs to sufficient volumes)
- Pay-as-bid remuneration





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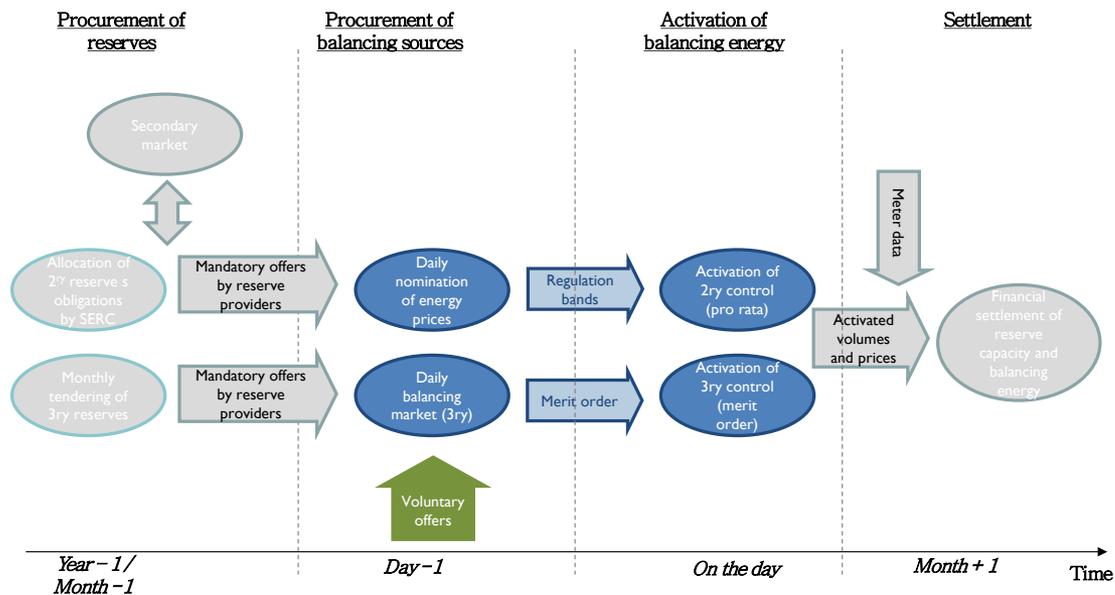
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# **Real time balancing (secondary and tertiary control)**



## Real time balancing - Overview

- Procurement
- Pricing
- Activation and delivery control
- Remuneration and settlement

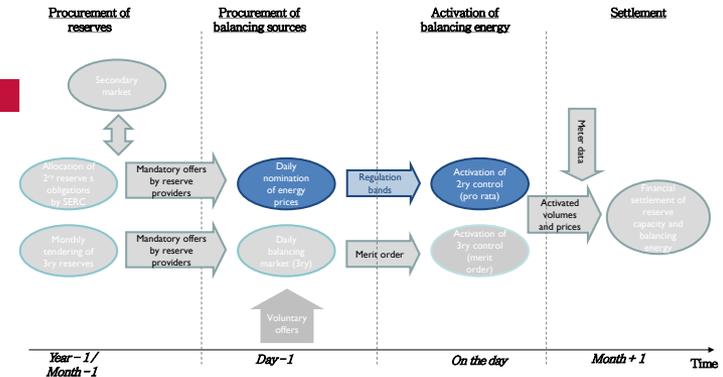




## Real time balancing – Secondary control

- **Procurement**

- BSPs with reserve obligations (taking into account transactions in the secondary market) are obliged to make corresponding volumes of reserve capacity available to the TSO (closed market: no additional offers allowed)
- Daily specification of energy prices:
  - BSPs specify price of balancing energy delivered from secondary control
  - Separate bidding for different time slots for the following day
  - Competitive bidding subject to regulatory constraints on balancing energy price (see below)

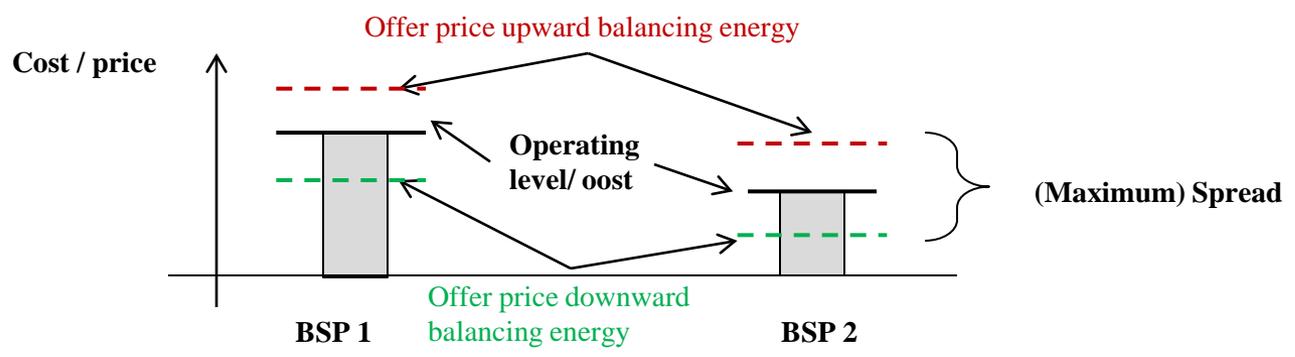
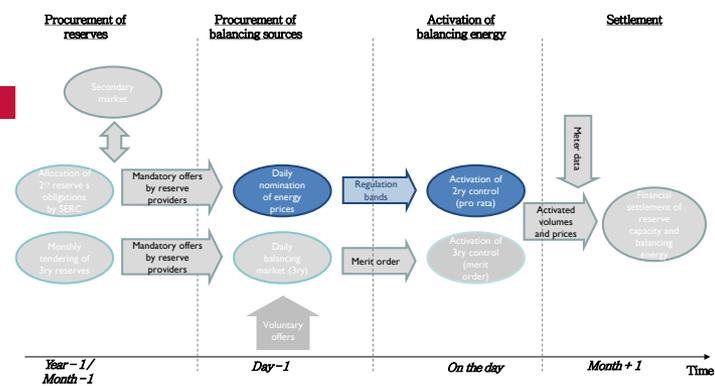




## Real time balancing – Secondary control

### • Pricing

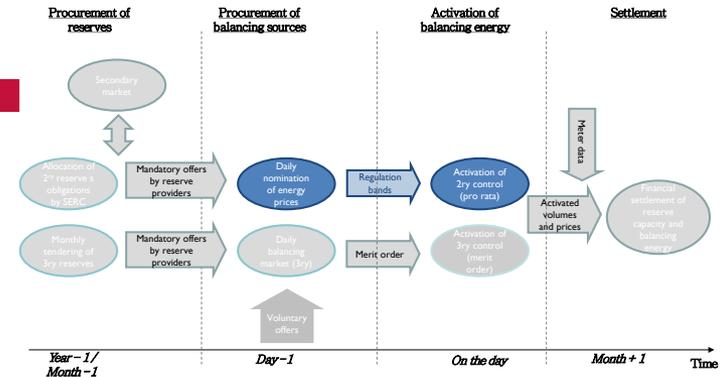
- BSPs are allowed setting them the energy prices for upward and downward regulation themselves
- Balancing energy prices for upward / downward regulation must remain within a pre-defined spread (set by SERC)
  - ⇒ BSPs will tend to set their prices around the value of (balancing) energy delivered from their plants, taking into account their production schedules as well as market prices
  - ⇒ Prices will only reflect the additional cost or savings from activation in real time (availability cost already covered by reserve payment)





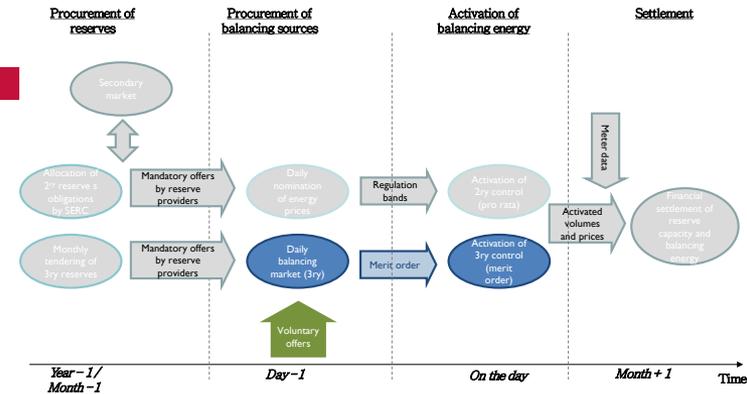
## Real time balancing – Secondary control

- **Activation and performance monitoring**
  - ISO activates all available secondary control (as today)
  - Requirement to strictly follow ISO activation signal
  - Delivery based on portfolio approach, but BSPs must inform the ISO about any changes in the plants for activation
  - ISO should develop and SERC approve the detailed methodology for monitoring and evaluation of the service quality performance for secondary control
- **Remuneration and Settlement**
  - Switch from in kind compensation to financial settlement
  - Remuneration only for the balancing energy activated by the ISO / actually delivered by the BSP
  - Volumes for settlement are determined through integration of control signal issued by ISO
  - Remuneration according to pay-as-bid principle





## Real time balancing – Tertiary control



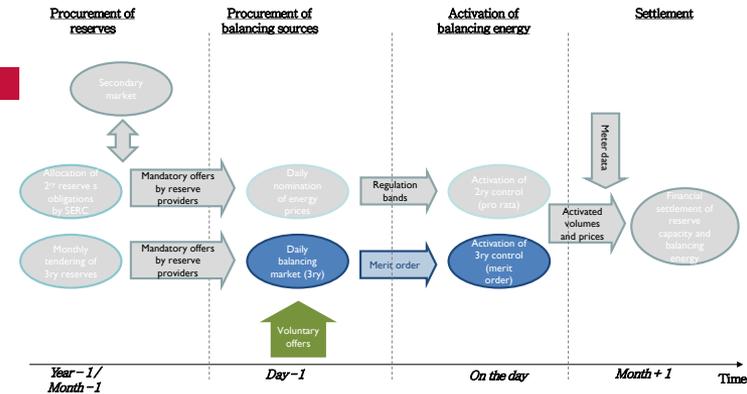
- **Procurement through daily balancing energy market**
  - Open market including mandatory bids from contracted reserve providers + additional voluntary bids
  - Additional bids subject to availability and technical capability
    - Bids from contracted reserve providers beyond their reserve obligation
    - Bids from others providers, e.g. demand
  - Separate bidding for different time slots for the following day
  - ISO builds merit order of bid prices in ascending order for upward regulation and in descending order for downward control
  - Bidders must hold capacity available for the specified time slots
  - ISO selects most economic bids from merit order in real time (no restrictions on number and duration of activation)



## Real time balancing – Tertiary control

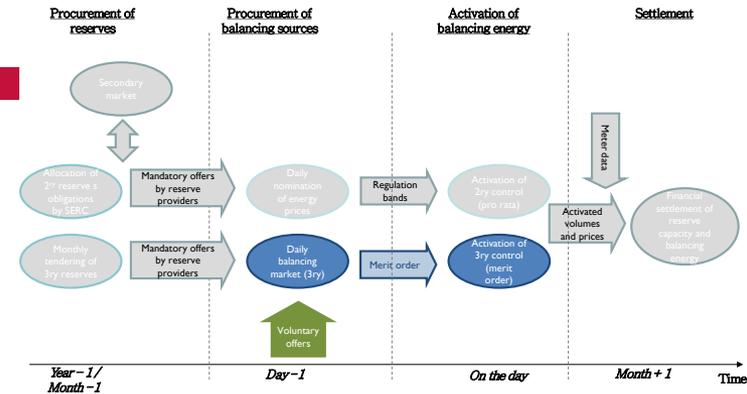
- Pricing

- Separate prices for upward and downward balancing energy
- Bids for upward regulation are subject to a regulated price cap, which is linked to a specified price index (e.g., foreign wholesale price, power exchange or balancing energy price)
  - Index and formula to be specified / approved by SERC
- No price limitation for downward control
  - Prices may even become negative





## Real time balancing – Tertiary control



- **Performance monitoring**
  - BSP should indicate which individual generation unit or demand user will provide tertiary control when submitting its daily offers
  - BSPs will enable the ISO to receive all necessary data for successful monitoring of the service deployment.
  - Monitoring of service delivery quality by ISO (verification of timely and sufficient action)
  - ISO should develop and SERC should approve a detailed methodology for the monitoring and performance evaluation of tertiary control
- **Remuneration and settlement**
  - All balancing energy delivered by a BSP is remunerated at the offered price (‘pay as bid’)
  - No payment for capacity



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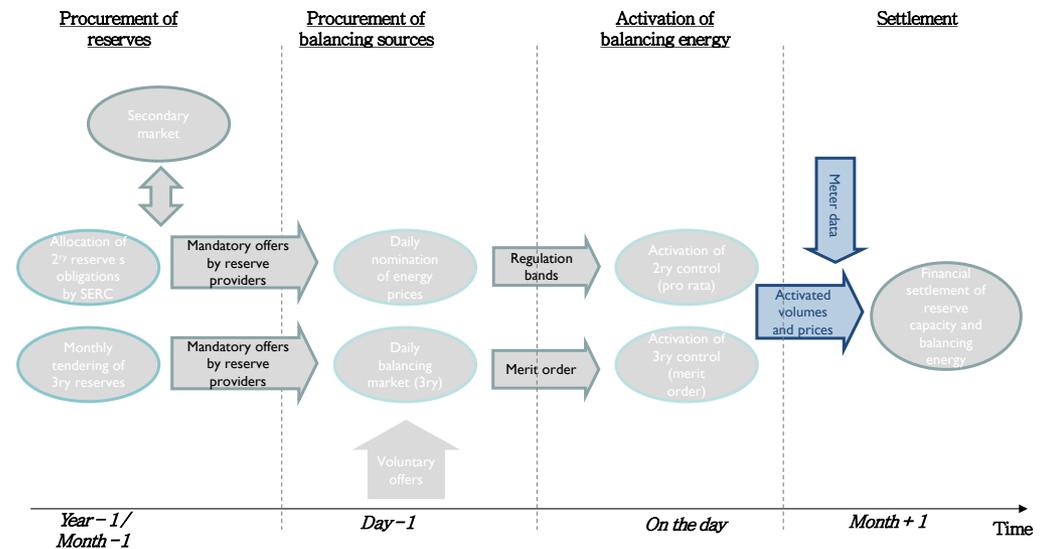
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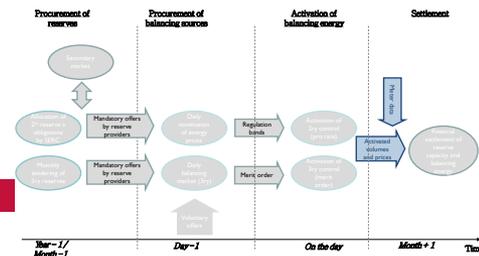
# **Metering and pricing of BRP imbalances**



# Metering and imbalance settlement

- **Metering**
  - Metering data
  - Settlement interval
- **Determination of hourly imbalances**
- **Imbalance Pricing**
  - Cost basis
  - Pricing mechanism
  - Additional incentives in case of insufficient reserves provided by BSPs

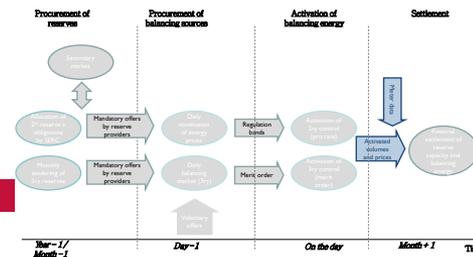




## Metering and imbalance settlement - Metering

- **Metering data**

- Correct and complete metering data are essential precondition for settlement
- Metering data must be provided by TransCo to all relevant stakeholders
  - Electricity production of each generating unit which is connected to the transmission network and/or providing balancing services to the power system,
  - Transmission offtake of all consumers directly connected to the transmission network and of distribution networks, separately for each connection point to the transmission network,
  - Cross-border exchanges between BiH and other countries

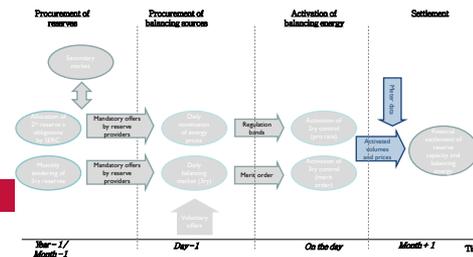


# Metering and imbalance settlement - Metering

- **Settlement interval**
  - Imbalance settlement currently based on 1h frequency
  - May be shortened to 15', once more detailed meter data becomes available

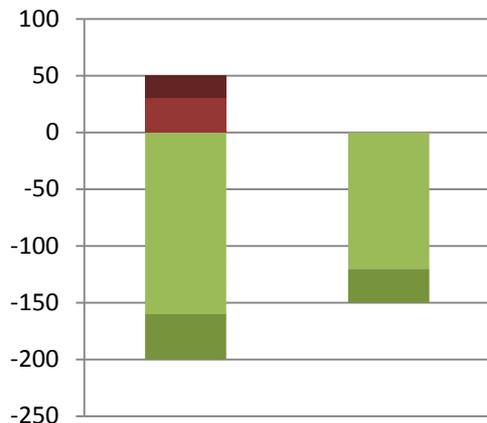
## Which meter readings are required for settlement?

	Type	Generation	Distribution	Cross border lines	Eligible customers
<b>Real time</b>	Real-time measurement data	(✓)	(✓)	-	(✓)
<b>Day after (D+1)</b>	Preliminary metering data	Hourly	Hourly	Hourly	Hourly
<b>Month after (M+1)</b>	Final metering data	Hourly	Hourly	Hourly	Hourly

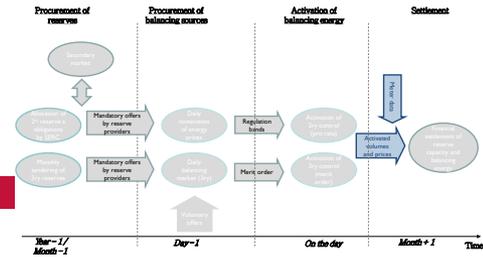


# Metering and imbalance settlement - Determination of hourly imbalances

- *Gross approach*, i.e. each BRP is liable to pay the imbalance settlement price for its own imbalances
- Sets strong incentives to minimize imbalances



		Gross		Net	
		nominal	pro-rata	nominal	pro-rata
<b>Amount (MWh)</b>	<u>EP1</u>	<u>-160</u>	Not applicable	<u>-160</u>	<u>-120</u>
	<u>EP2</u>	<u>-40</u>		<u>-40</u>	<u>-30</u>
	<u>EP3</u>	<u>30</u>		<u>0</u>	<u>0</u>
	<u>EP4</u>	<u>20</u>		<u>0</u>	<u>0</u>



## Metering and imbalance settlement - Imbalance Pricing

- **Cost basis**
  - Imbalance settlement will only account for the cost of balancing energy
  - Cost of reserve provision will be recovered separately, i.e. ancillary services tariff
  - Recommend marginal pricing of combined secondary and tertiary control balancing actions
  - Focus on ensuring strong incentives on BRPs to avoid and/or correct their own imbalances
- **Pricing mechanism**
  - Suggest 2-price system, i.e. positive and negative imbalances are priced differently
  - In many cases, only secondary control will be activated: due to the pre-defined spread between upward and downward secondary control, imbalance settlement prices will correspond to the marginal price of balancing energy from secondary control
- **Additional incentives in case of insufficient reserves provided by BSPs**
  - Need additional incentives to minimize BRP imbalances in case of insufficient reserves being available
  - Suggest use of additional incentive component to be paid by BRPs in corresponding cases for their imbalances



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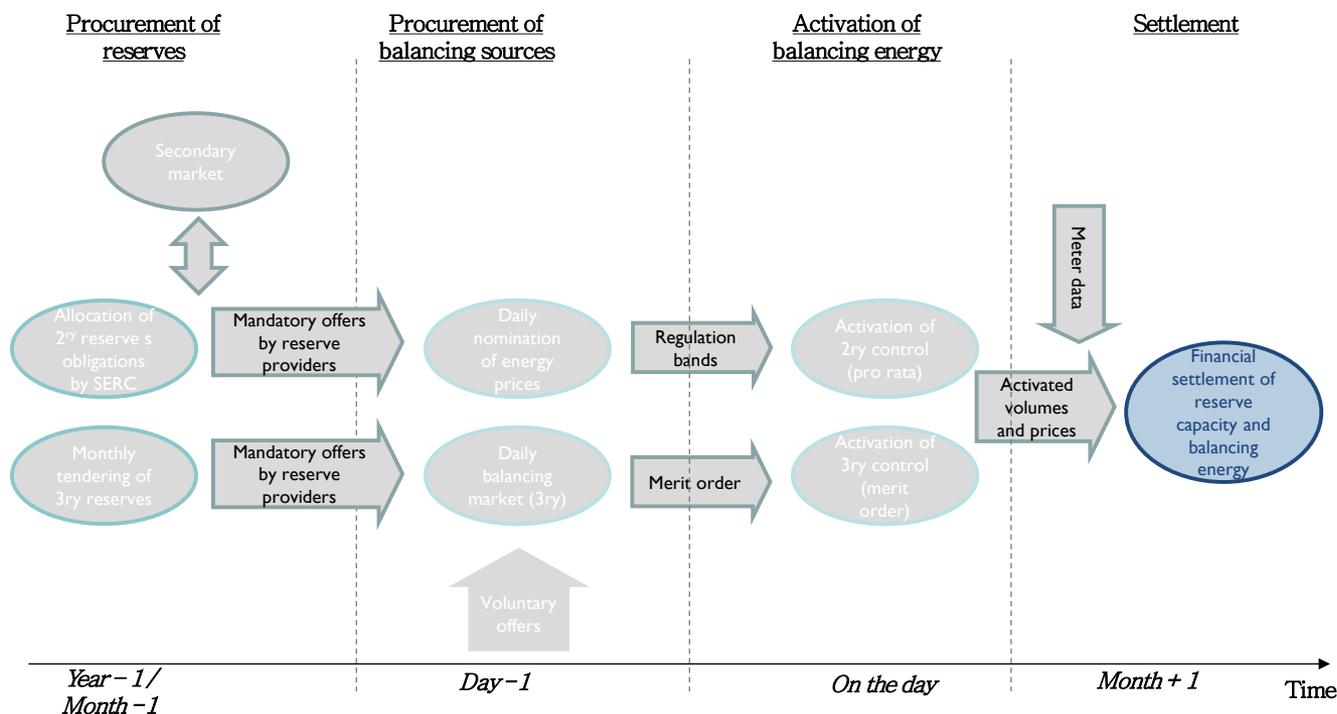
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# Financial settlement



## Financial settlement

- Relevant cost and revenue streams
- Administration of payments





## Financial settlement – Relevant cost and revenue streams (I)

	Cost for ISO	Revenues for ISO
<b>Reserve provision</b>	<ul style="list-style-type: none"><li>• Payments to BSPs for reserve provision (base reserve price),</li><li>• Potentially, additional cost for procurement on missing volumes</li></ul>	<ul style="list-style-type: none"><li>• Penalties paid by BSPs for (partial) non-provision of reserves and/or provision of inadequate service quality</li></ul>
<b>Balancing energy</b>	<ul style="list-style-type: none"><li>• Payments to BSPs for activation of upward balancing energy</li><li>• Payments to BSPs for activation of downward balancing energy bids with negative bid price</li></ul>	<ul style="list-style-type: none"><li>• Payments by BSPs for activation of downward balancing energy bids with positive bid price</li><li>• Penalties paid by BSPs for (partial) non-provision of reserves and/or provision of inadequate service quality</li></ul>
<b>Imbalance settlement</b>	<ul style="list-style-type: none"><li>• Payments by BRPs with negative imbalances (surplus), only in case of positive imbalance prices for negative imbalances</li></ul>	<ul style="list-style-type: none"><li>• Payments by BRPs with positive imbalances (energy deficit)</li><li>• Payments by BRPs with negative imbalance (surplus), only in case of negative imbalance prices for negative imbalances</li></ul>



## **Financial settlement – Relevant cost and revenue streams (II)**

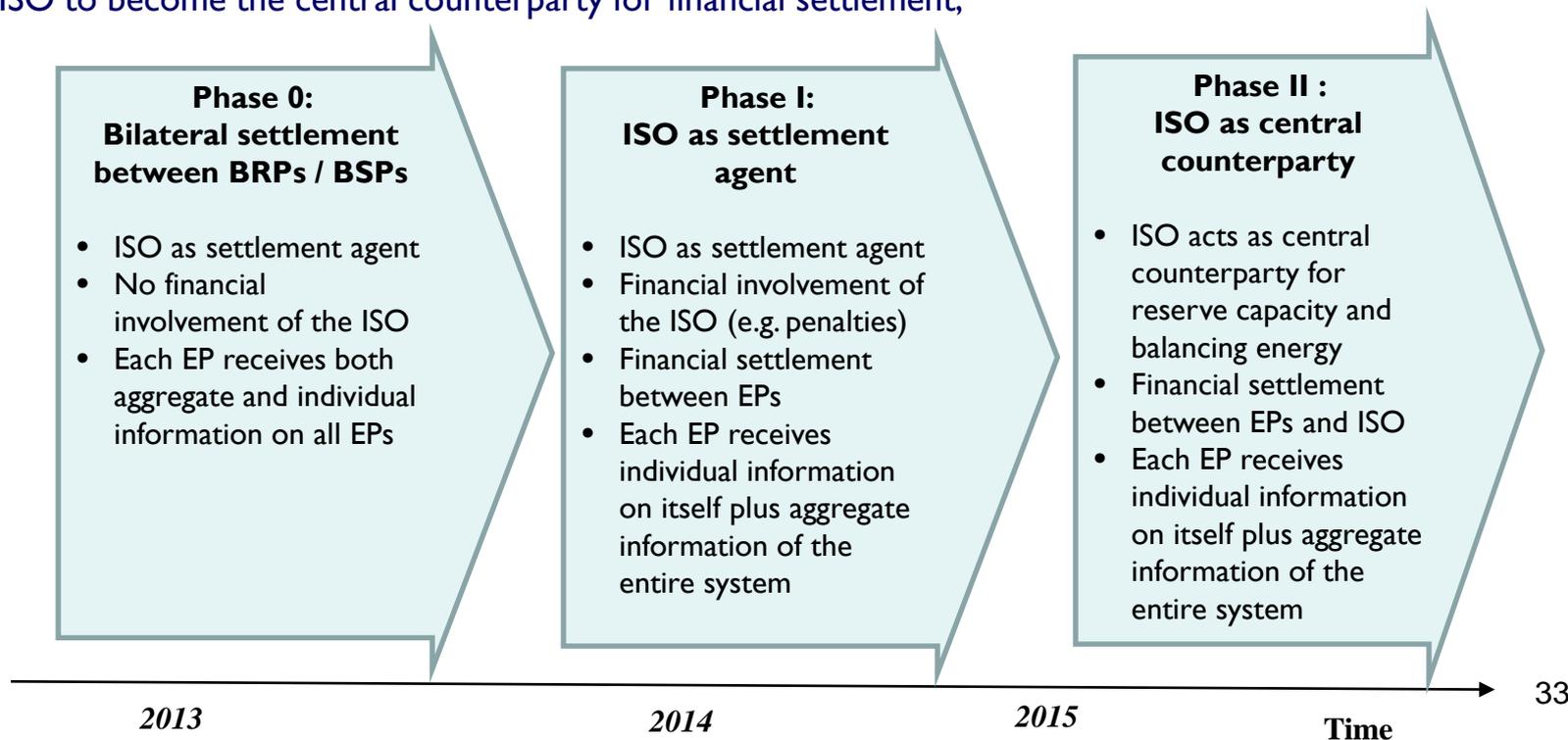
- Settlement should be financially only
- ISO will establish one or more accounts for financial settlement of all relevant income / cost
- Separate accounts may be used for:
  - Reserve capacity (secondary and tertiary control)
  - Balancing energy
  - Imbalances
- All payments to be made should be netted
- Propose monthly neutralization of all deviations between total costs and revenues
  - Residual amounts distributed to BRPs pro rata their total consumption in each month
- Deviations may result from:
  - Marginal pricing of imbalance vs. ‚Pay-as-bid‘ remuneration of balancing energy
  - 2-price imbalance settlement
  - Penalties



# Financial settlement – Administration of Payments

Once market elements are introduced, relevant settlement data must be disclosed to EPs on an individual basis only, in order to ensure confidentiality of private bidding data

ISO to become the central counterparty for financial settlement,





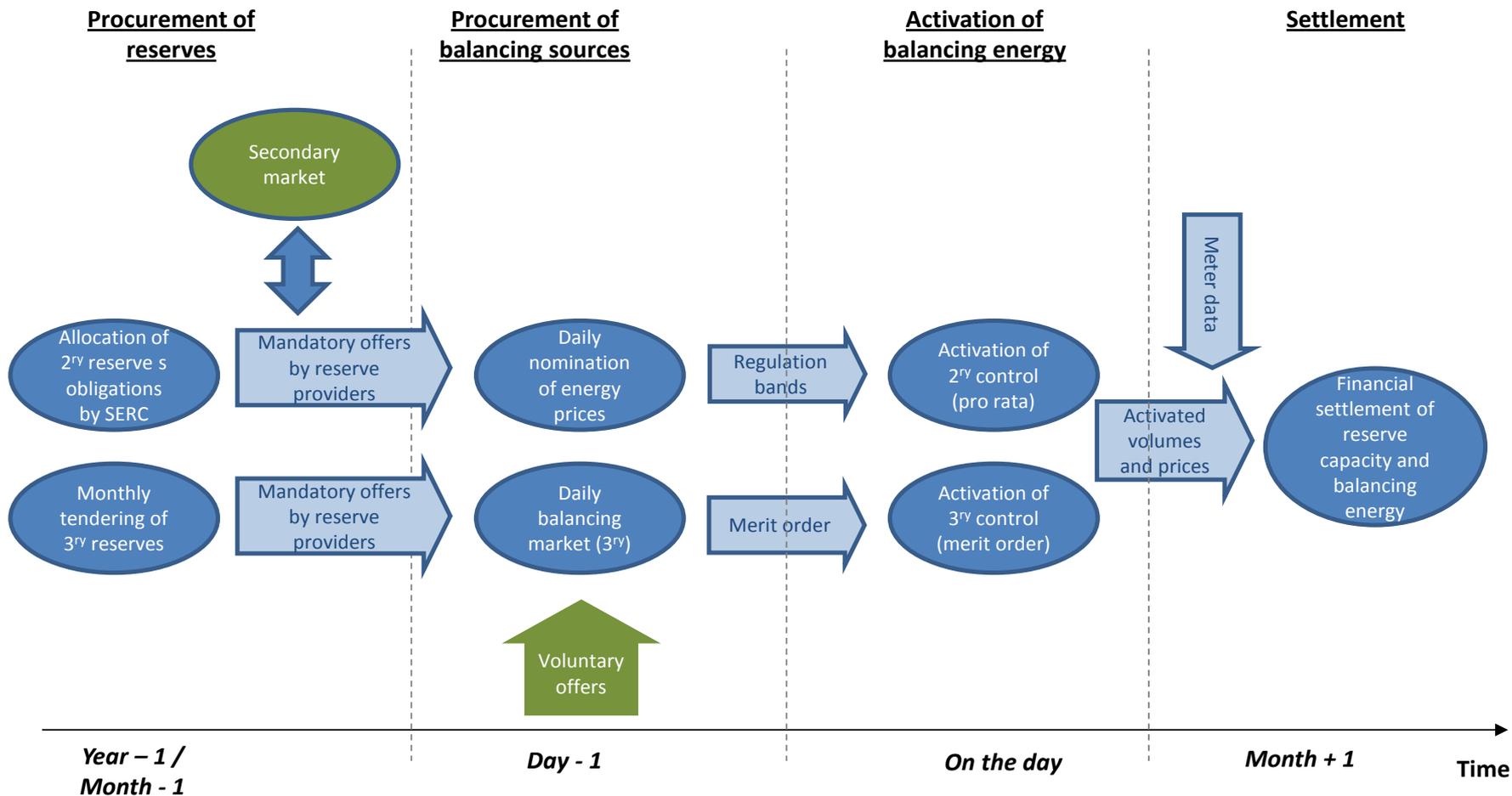
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## Summary



## Overview





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# **Next steps and required institutional changes**



## Required regulatory changes

- Adjustment of Market Rules (various issues)
- Adjustment of Grid Code (various issues)
- SERC
  - Develop rules for allocating reserve obligations on individual service providers (can be incorporated into Market Rules),
  - Adjust pricing methodology for secondary control reserves (with regulated or indexed prices)
  - Develop methodology for setting of penalties for non-delivery of reserve capacity and failure to provide ancillary services in accordance with the agreed quality standards (may be covered by Market Rules)
- Check and adjust (where necessary ) inter-TSO operational agreements in the control block, in order to facilitate cross-border exchange of secondary control



## Required organizational / technical changes

- All necessary metering data must be made available to all relevant parties
- Update existing / Introduce new processes and systems at the ISO :
  - Monthly tendering of tertiary control
  - Daily balancing mechanism,
  - Monitoring and evaluation of service quality of ancillary service provision,
  - Financial settlement of ancillary services, balancing energy and BRP imbalances (including establishment of one or more financial accounts)
- No other changes required concerning:
  - Control facilities are available
  - Communication network is robust and operational
  - All necessary metering and measurement data are available and supported by equipment with the necessary accuracy



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