Evolution of the Greek Electricity Market: TSO view

Iraklis Skoteinos

Director of Market Management, IPTO S.A.

BoD member of HEnEx S.A.

Independent Power Transmission Operator S.A.

The role of IPTO

System ownership, Development and Maintenance

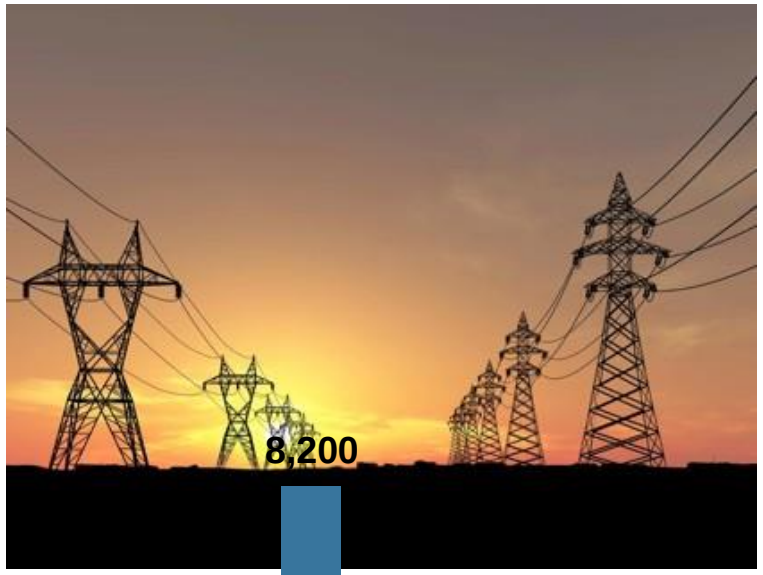
- System design and development (rolling 10-year plan)
- Asset Management and Maintenance
- System access to license holders for production, supply, or trading
- User/3rd party interconnection projects (engineering services)

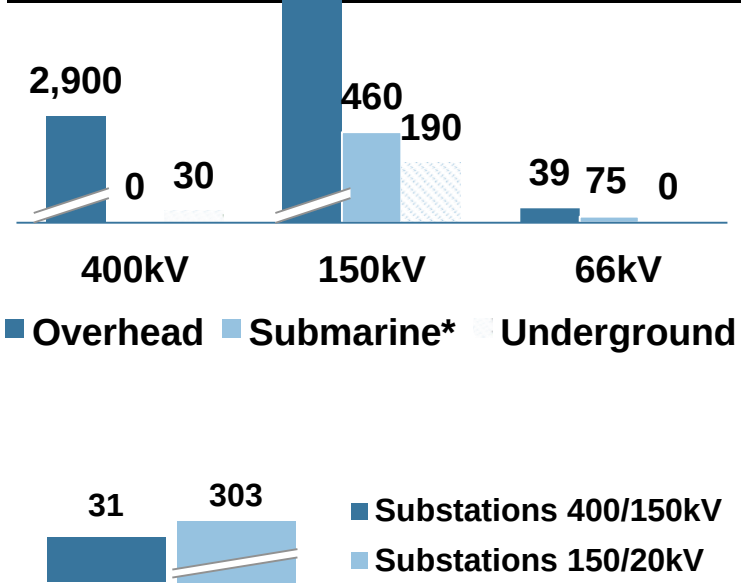
System and Market Operation

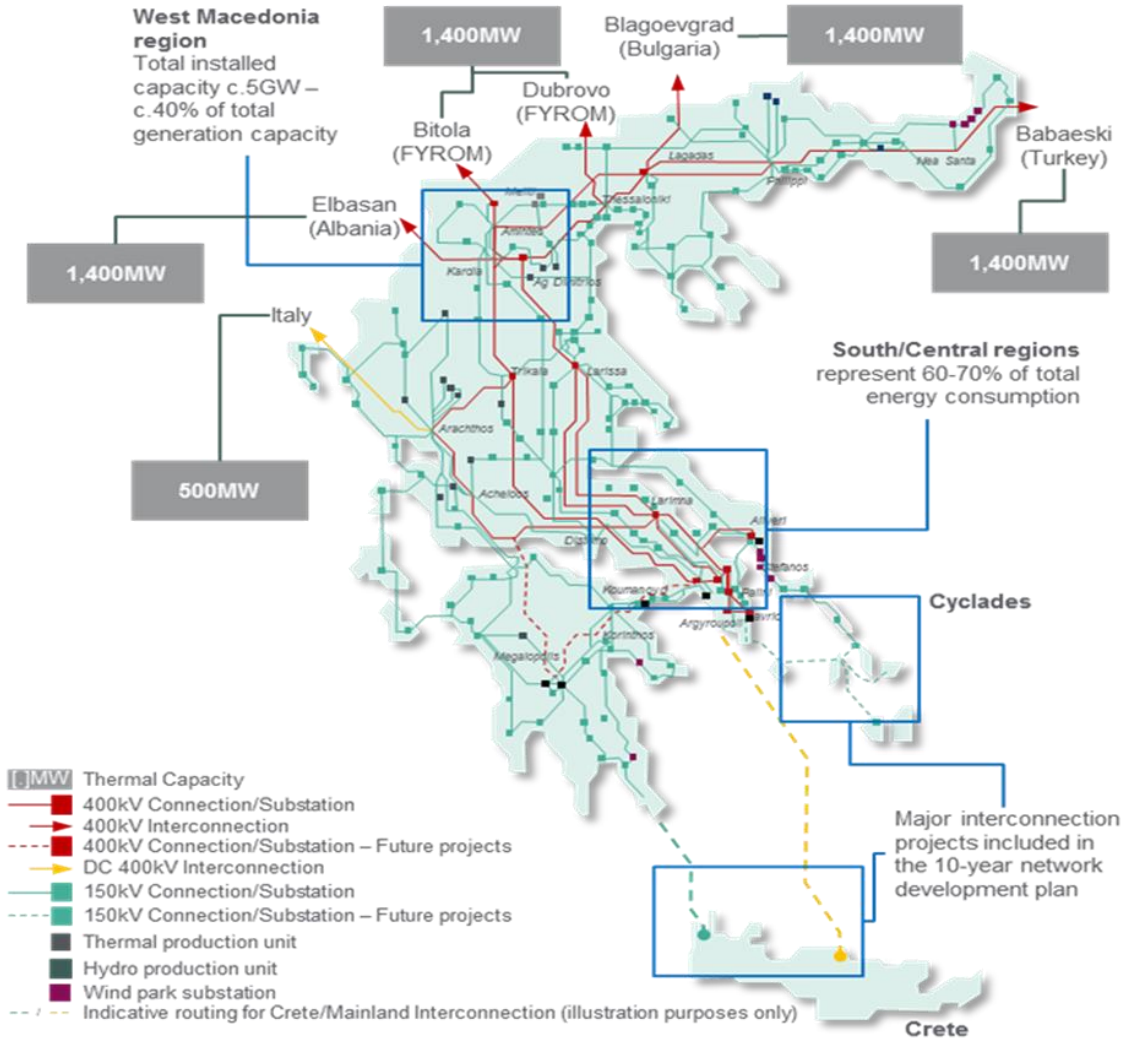
- System Operation (Dispatch instructions, system security and stability)
- Balancing Market Management (capacity market, ancillary services and imbalances)
- Other market mechanisms (i.e. flexibility, interruptibility, CRM)
- Management of cross-border capacity
- 20% shareholder in HEnEx

Continuous cooperation with stakeholders and all European TSOs as member of ENTSO-E

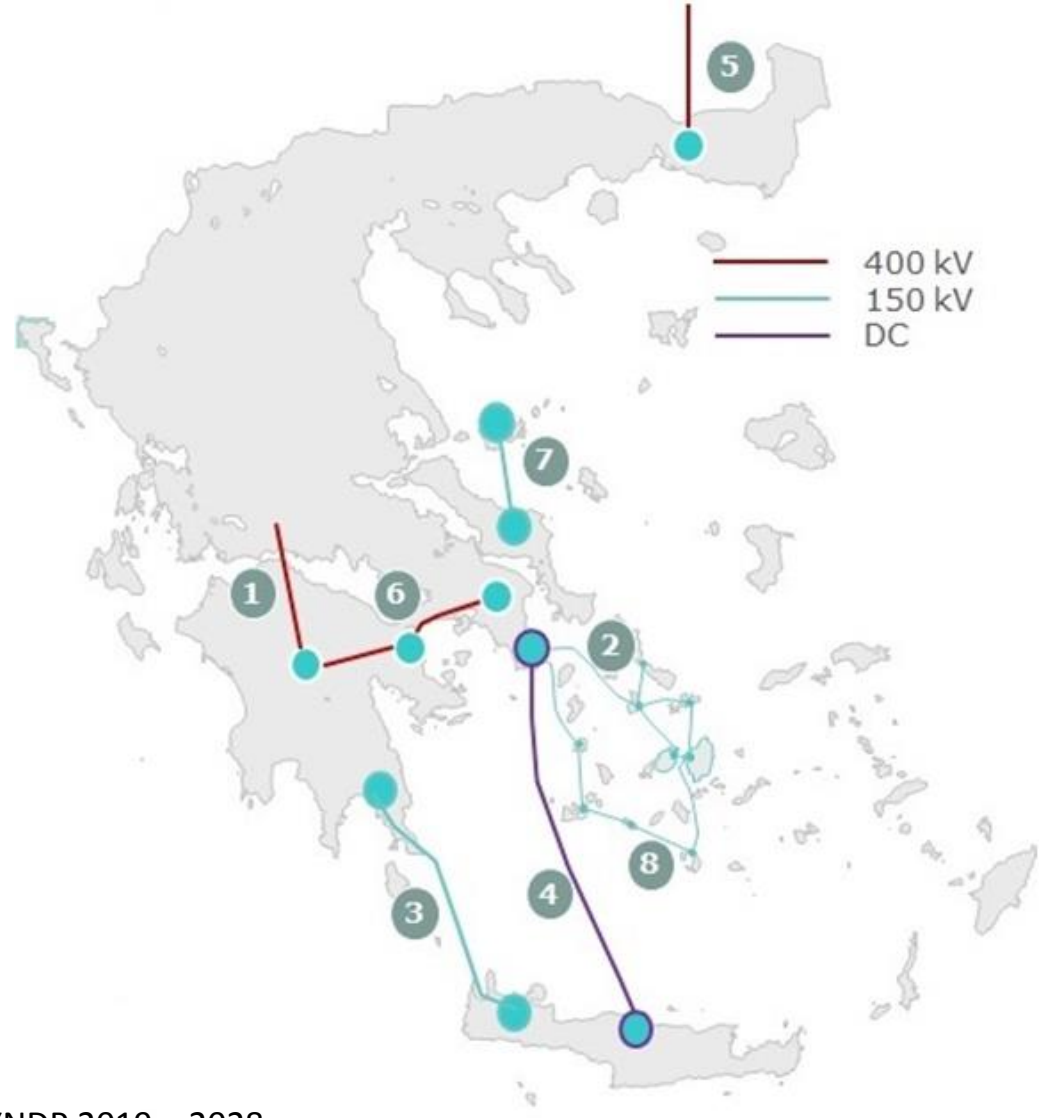
The Greek Interconnected Electricity System







Major System Investment Projects



ID	Project description	Expected commissioning year
1	First 400 kV branch to Peloponnese (OHL Megalopoli – Patras – Acheloos)	2019
2	Cycladic Islands interconnection (Phases A, B and C)	2020 (2018 for Phase A, 2019 for Phase B and 2020 for Phase C)
3	Crete interconnection (Phase I)	2020
4	Crete interconnection (Phase II)	2023
5	New 400 kV interconnector to Bulgaria N. Santa (GR) – Maritsa (BG)	2023
6	Second 400 kV branch to Peloponnese (OHL Megalopoli – Korinthos – Koumoundouros)	2024
7	Skiathos island interconnection	2020
8	Cycladic Islands interconnection (Phase D)	2024

Source: TYNDP 2019 – 2028

The TSO in the Electricity Market

- The TSO is involved in all market stages:

  - **Capacity Calculation & Congestion Management**: TSO & RSC – *Common Capacity Calculation, Redispatching and Countertrading Methodologies*
  - **Forward Capacity Allocation**: TSO & JAO/SEE CAO – *Harmonized Auction Rules, Physical and Financial Transmission Rights*
  - **Day-Ahead Markets**: NEMO & TSO – *ATC calculation and implicit auctions*
    Intra-Day Markets: NEMO & TSO – *ATC calculation and continuous implicit auctions (XBID, CRIDAs)*
  - **Balancing Market**: TSO – *Reserves, Real Time Balancing Market, Settlement of Imbalances*

Balancing means all actions and processes, on all timelines, through which TSOs ensure, in a continuous way, the maintenance of system frequency within a predefined stability range, and compliance with the amount of reserves needed with respect to the required quality.

Why Balancing Market?

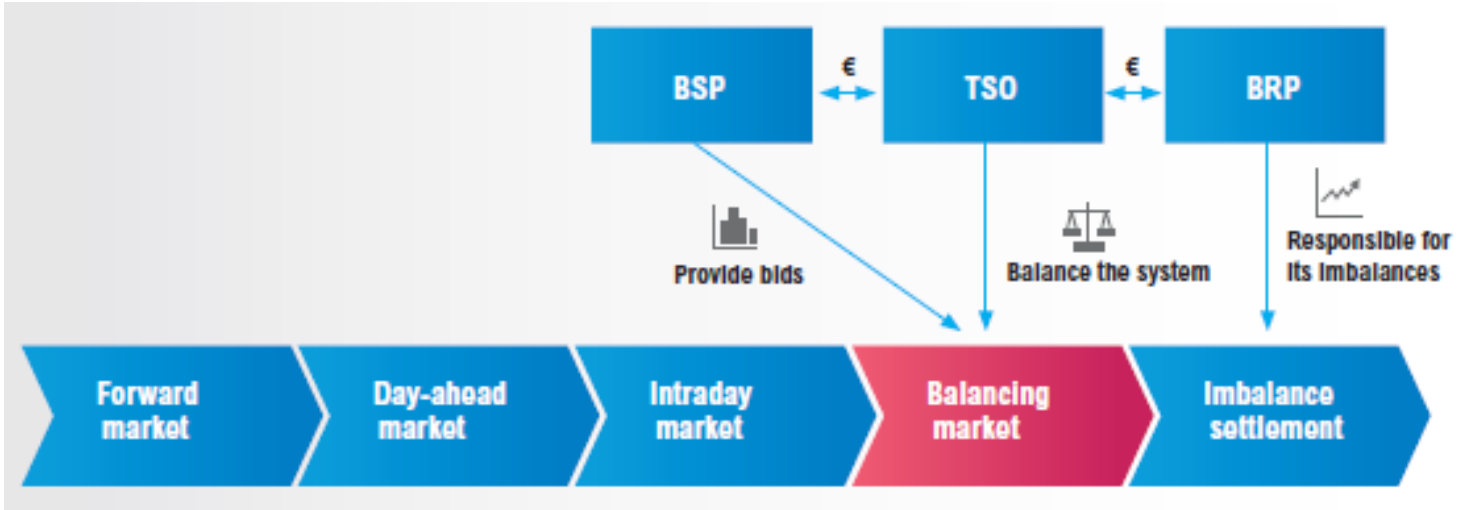
- The core TSO business of system balancing, must be performed in the most economic efficient way
- Financial incentives should be given to all sources that are able to contribute to the balancing of the system
- All imbalances from market schedules must be cleared at a fair price, which reflects the availability of balancing sources and system condition
- The imbalance price should provide incentives for overall reduction of balancing needs (fewer in number and less in volume imbalances)
- The Balancing Market price signal must be present in order to reflect to all other market stages

Balancing Market characteristics

- The Balancing Market is the only market where financial and physical interactions are crossed
- The design of the Balancing Market must contain the element of procurement of balancing resources (reserves) ahead of real time
- European Balancing Markets are not equally harmonized compared to the other energy markets
- Balancing Market have low volumes, but high price volatility
- Balancing Markets are technical, demanding markets, which however provide important revenue streams to active participants

Greek Balancing Market Main Elements

- Central Dispatch & Unit based scheduling & dispatching
- BSP participant categories eligible to provide balancing energy & capacity:
  - Generation Units (obligatory participation)
  - Renewable Energy Sources (and storage)
  - Demand Response
- BSPs need to pass prequalification tests
- Portfolio based scheduling & dispatching for RES and DR
- All other participants are BRPs



The Balancing Market Process

Integrated Scheduling Process (ISP)

(30 mins)

Balancing capacity procurement

- ✓ **FCR**
- ✓ **mFRR**
- ✓ **aFRR**

Capacity remunerated pay-as-bid

Unit commitment schedule

Balancing Energy Market (RTBM)

(15 mins)

Balancing energy procurement

- ✓ **mFRR**
- ✓ **aFRR**

mFRR remunerated on marginal price

aFRR remunerated pay-as-bid

Balancing Energy & Capacity, and Imbalance Settlement

(15 mins)

Metering

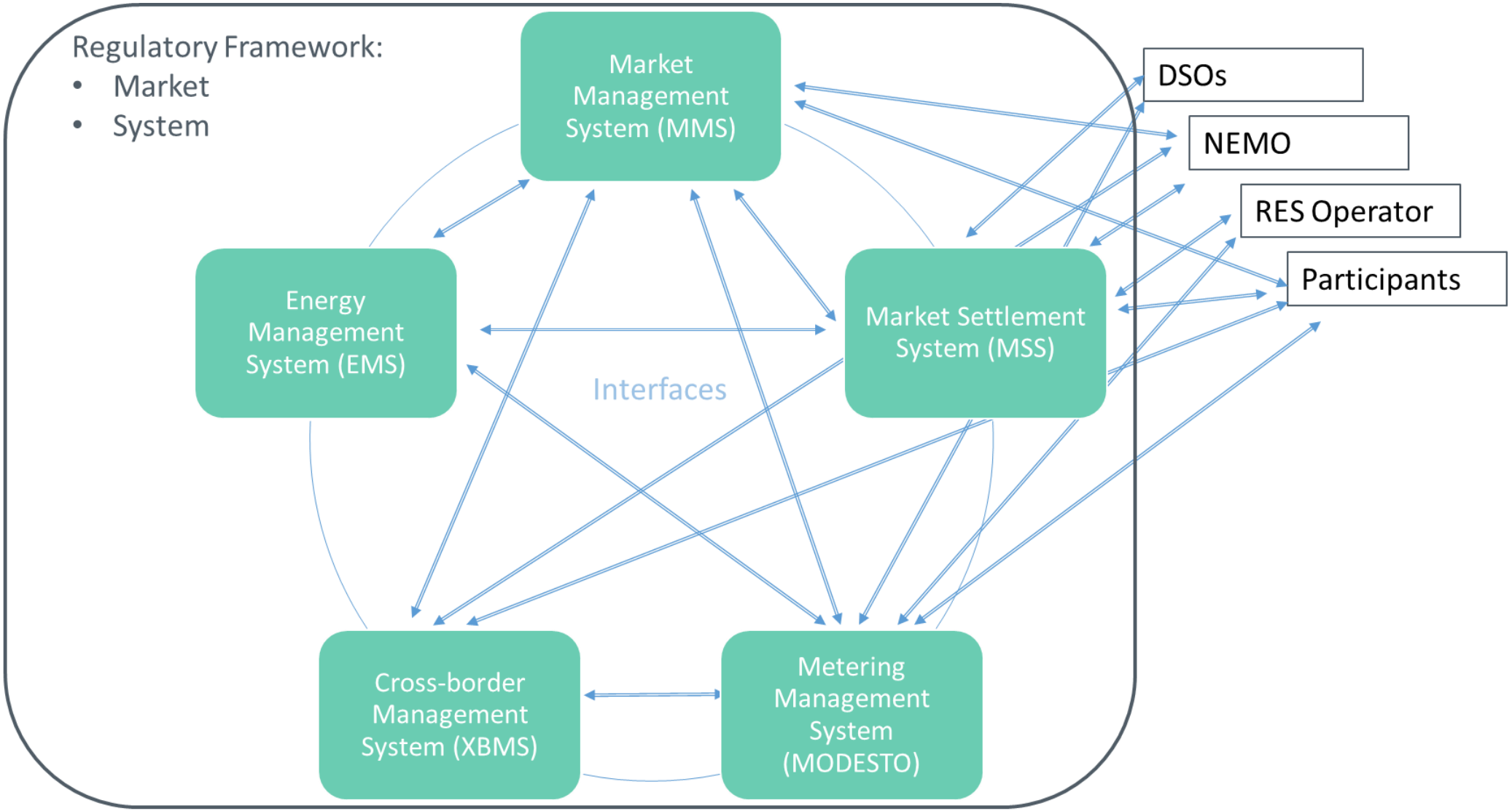
Quantities, prices & amounts calculation

Single Imbalance Price

Main differences with current market model

- Active market participants (BSPs) provide distinct offers for the Balancing Market (TSO trading platform); no cap for offers
- During the scheduling stage (ISP) and near real time (RTBM) the market algorithm minimizes the cost of forecasted imbalances for a 30 mins or 15 mins dispatch period respectively
- The real time dispatch and imbalance settlement period will be 15 mins
- All deviations from market schedules or instructions are considered imbalances (no tolerance factor)
- All calculations and energy settlement performed by the TSO, invoicing, financial clearing and risk management performed by a Clearing House
- System losses are bought by the TSO at all market stages (no losses charged for system injections)
- Uplift accounts related to 'System Losses', 'Balancing Capacity' and 'Economic Neutrality of TSO' are charged only to end-customer suppliers

Balancing Market IT systems



Other important market updates

- **Market Coupling** with Italy scheduled for Q4 2020; coupling with Bulgaria to follow briefly after (Q1/2 2021)
- Currently Greece is a single **Bidding Zone**. A proposal is currently drafted for the Regulatory Authority for Energy for **Crete** to become a second Bidding Zone once phase 1 of the interconnection is complete
- IPTO, ESO-EAD and Transelectrica have commonly agreed for the establishment of a **Regional Security Coordinator (RSC) in Thessaloniki**. The RSC will perform current five mandated services of: Coordinated Capacity Calculation (CCC), Coordinated Security Analysis (CSA), Outage Planning Coordination (OPC), Short-Term Adequacy (STA) and development of Common Grid Model (CGM), within 2020
- Development of **pan-European electricity balancing platforms**, expected go live in waves until 2023 (IGCC, MARI, PICASSO, TERRE)

Thank you for your attention

i.skoteinos@admie.gr

www.admie.gr