Introduction of MAVIR and the Hungarian Electric Power System

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I. Introduction of MAVIR and the hungarian power system

II. Different categories of reserves and services

III. System balancing (activation of reserves)
I/1. CORE ACTIVITIES OF MAVIR

**System operation**
- Real time system operation to maintain the system balance
- Middle- and long-term planning of the Hungarian Power System
- Management of international relationships

**Transmission**
- Operation of the Transmission System (220-750 kV power lines and the related substations)
- Performing any renewal, maintenance and development works on the Transmission System

**Market operation**
- Operation of the ancillary services’ market and the balancing group system
- Allocation of the cross-border capacities
- Settlement metering
- Operation of the subsidy system (renewables and cogen)
I/2. HUNGARY IN THE EU

VILLAMOSENERGIA-RENDSZEREK EURÓPÁBAN
POWER SYSTEMS IN EUROPE

AZ ENTSO-E SZINKRONTERÜLETEIN:
SYNCHRONOUS REGIONS OF ENTSO-E:

- Kontinentális Európa
  Continental Europe
- Észak-Európa
  Northern Europe
- Balti országok (szinkron üzemben az UPS/IPS rendszerrel)
  Baltic countries (synchronously interconnected with UPS/IP system)
- Nagy-Britannia
  Great Britain
- Ír-sziget
  Ireland
- Különálló szigetek
  Isolated systems
- UPS/IPS szinkronrendszer
  UPS/IPS synchronous system
- Kontinentális Európa rendszerrével szinkron üzemelő villamosenergia-rendszer
  Power system synchronously interconnected with the power system of Continental Europe
- ENTSO-E-tag
  ENTSO-E member
- ENTSO-E megfigyelő tag
  ENTSO-E observer member
- Nem ENTSO-E-tag
  Not member of ENTSO-E
### I/4. TRANSMISSION NETWORK

<table>
<thead>
<tr>
<th>Nyomvonal ROUTE</th>
<th>Rendszer CIRCUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>750 kV</strong></td>
<td>268,10</td>
</tr>
<tr>
<td><strong>400 kV</strong></td>
<td>2 287,16</td>
</tr>
<tr>
<td><strong>220 kV</strong></td>
<td>1 099,32</td>
</tr>
<tr>
<td><strong>132 kV</strong></td>
<td>142,04</td>
</tr>
<tr>
<td><strong>132 kV</strong></td>
<td>16,64</td>
</tr>
<tr>
<td><strong>Összesen TOTAL</strong></td>
<td><strong>3 813,26</strong></td>
</tr>
</tbody>
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**A magyar átviteli hálózat (2017)**

**The Hungarian transmission network (2017)**

![Map of the Hungarian transmission network](image)
I/5. TRANSMISSION AND DISTRIBUTION NETWORK

MAVIR

400 kV

220 kV

120 kV

35-20-10 kV

400/230 V

Domestic consumers

Industrial consumers

Industrial consumers

Distribution companies
TOTAL (2017)
Installed Capacity: 8617 MW
Constant loss: 1500,3 MW
Available capacity: 7116,7 MW
Peak load: 6780 MW
I/7. SOURCES OF TOTAL GROSS ELECTRICITY CONSUMPTION

Teljes bruttó villamosenergia-felhasználás / Total gross electricity consumption: 45 057,4 GWh
Hazai termelés / Domestic energy production: 32 181,0 GWh
II. DIFFERENT CATEGORIES OF RESERVES AND SERVICES

Balancing services → Frequency related services

- Primary control reserve → Frequency Containment Reserve (FCR)
- Secondary control reserve → Frequency Restoration Reserve (FRR)
  - Automatic → a-FRR
  - Manual → m-FRR
- Tertiary control reserve → Replacement Reserve (RR)

System (network) services → Non-frequency related services

- Reactive power management and voltage control
- Black start function and Island operation
- Congestion management
III/1. SYSTEM BALANCING (ACTIVATION OF RESERVES)
III/2. SYSTEM RESERVES IN REAL TIME OPERATION

- Spinning reserves (planned)
- Spinning reserves (actual)
- Control demand
- SUM of market schedules
- Estimated system load
- Actual system load

Graph showing estimated system load, actual system load, control demand, sum of market schedules, and spinning reserves.
III/3. ACTIVATION OF BALANCING RESERVES IN REAL TIME OPERATION
III/4. PROCESS OVERVIEW

Prequalification: Every unit which is qualified for a service has to provide its service (offer its capacity), but submission for a tender is allowed only after a successful prequalification.

Activation: Based on merit order list (MOL)

Products, time resolution: BIDs have hourly resolution, but activation and settlement are based on 15 minutes. Imbalance settlement and local scheduling period are also 15 min.
Thank you for kind attention!