Kosovo Transmission System Development
Achievements and Challenges
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KOSTT Role in the Power System of Kosovo

- KOSTT J.S.C is a public company, the shareholder of which is the Republic of Kosovo, through the Ministry of Economic Development.

- The Transmission System Operator manages operation, maintenance and development the electricity transmission system in the HV levels of network 400kV, 220kV and 110kV.

- KOSTT performs:
  - Real Time Operation
  - Observability of neighboring transmission grids
  - Short (Day Ahead), Medium and Long term Planning/Analysis

- Provide Transmission service under regulated tariff
- Provide non-discriminatory open access to the grid
- Enhance reliability and balancing the system
- Planning, development and maintenance of network responsibility
- Transmission delivery service
- Facilitate and operate the Market
Kosovo Transmission system interconnected with regional network
KOSTT main infrastructure and system data (actual)

Transmission lines

<table>
<thead>
<tr>
<th>HV Lines in KOSTT</th>
<th>Line length km</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 kV</td>
<td>279.7</td>
</tr>
<tr>
<td>220 kV</td>
<td>231.8</td>
</tr>
<tr>
<td>110 kV</td>
<td>841.8</td>
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</tbody>
</table>

Total line length = 1353.4 km

Power Transformers and SS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Autotransformers</td>
<td>3750 MVA</td>
</tr>
<tr>
<td>Transformers</td>
<td>2080 MVA</td>
</tr>
<tr>
<td>Main HV Substations</td>
<td>6</td>
</tr>
<tr>
<td>Load Substations</td>
<td>28</td>
</tr>
</tbody>
</table>

Peak demand last three years

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>1129</td>
<td>1160</td>
<td>1161</td>
</tr>
</tbody>
</table>

Electricity demand

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>GWh</td>
<td>5663</td>
<td>5426</td>
<td>5781</td>
</tr>
</tbody>
</table>

Increase tendency
Transmission vertical and horizontal network capacities (actual)

Internal network (vertical) capacities Y-2017

- For N security criterion the network capacity is **1700 MW**
- For N-1 security criterion the network capacity is **1160 MW**
- Security margin is C(N) – Peak = 1700 - 1161 = **539 MW**

Interconnection capacities Y-2017

<table>
<thead>
<tr>
<th>Interconnection lines of KOSTT</th>
<th>Voltage</th>
<th>NTC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kosovo-Serbia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS Kosova B - SS Nis 2</td>
<td>400 kV</td>
<td>600 MW</td>
</tr>
<tr>
<td>NS Podujeva – NS Krushevac</td>
<td>220 kV</td>
<td></td>
</tr>
<tr>
<td><strong>Kosovo - Macedonia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS Ferizaj 2 - NS Shkupi 5</td>
<td>400 kV</td>
<td>400 MW</td>
</tr>
<tr>
<td><strong>Kosovo - Montenegro</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS Peja 3 – NS Ribarevina</td>
<td>400 kV</td>
<td>400 MW</td>
</tr>
<tr>
<td><strong>Kosovo Albania</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS Kosova B – NS Tirana 2</td>
<td>400 kV</td>
<td>600 MW</td>
</tr>
<tr>
<td>NS Prizreni 2 – NS Fierza</td>
<td>220 kV</td>
<td></td>
</tr>
</tbody>
</table>

**1500 MW** Simultaneous export capacities

**1400 MW** Simultaneous import capacities

High ratio : Capacity/Peak = 1.29

System Adequacy = ✔
Objectives of Transmission infrastructure investments

• Enable security and quality of supply as far as transmission capacity concerned
• Reduction of power losses
• Reduction of Energy not Supplied
• Fully complaint with GRID CODE and ENTSO-E requirements
• Support for connection of 450 MW new TPP “Kosova e Re”
• Support for Renewable Energy Integration in Transmission System
• Support for economic development of the country
• Support for market development and regional integrations of KOSTT
• Ensure stable transit flows through KOSTT network for regional power systems needs
Main Transmission Investment Projects implemented 2007-2017

- **Reinforcement category:**
  - 2 400/110 kV substations,
  - Interconnection line 400kV Kosovo –Albania together with LFC project
  - 12 new 110 kV lines and re-conductor (increase of capacities)
  - 5 autotransformers and 21 power transformers

- **Load support category**
  - 7 110/35/10 kV Substations

- **Refurbishment Category**
  - 90% of existing Substations are renewed (modern equipment's)

- **System Support Category**
  - New SCADA/EMS system
  - Modern telecommunication infrastructure
  - New measurement systems at interconnection and with other connected parties
  - 100% new relay protection systems

56 projects
- 2- 2007
- 2- 2008
- 6- 2009
- 6- 2010
- 4- 2011
- 8- 2012
- 4- 2013
- 2- 2014
- 1- 2015
- 11- 2016
- 10- 2017

Total investments 236 M€
5 Year investment development Plan 2018-2023

Transmission projects:
- New 110 kV Lines and reinforcements of the lines
- 6 New 110/10(20) kV substations for load support (Regions: Mitrovica, Drenasi, Prishtina, Fushë Kosova, Malisheva, Dragashi)
- Refurbishment of 4 Substations 110/35/10 kV
- 4 new Power Transformers 40MVA
- Upgrade of Telecommunication systems, SCADA/EMS, Metering Systems and Relay Protection Systems
- Upgrade of Market IT support Systems
- Support for regional activities CAO, APEX, RSCI, ENTSO_E, SECI etc.

Total planned investments 2018-2023
60 M€
Integration of 450 MW TPP “Kosova e Re” in Transmission system

- Considering Strong interconnections of Kosovo Transmission Network and large investments in last decade, the Transmission network is able to accommodate 450 MW New TPP in the Kosovo Power System.
- The existing capacities and the system performance will ensure stable and secure operation of 450 MW TPP. Kosovo transmission network has sufficient security margin also for the N-1 security criterion, and the security margin will increase after putting on load the 400 kV interconnection line with Albania.
- Several was perform about dynamics and transient analyses of transmission network. The studies/analyses shown that unit of 450 MW will remain stable during any disturbances in the network.
- The 450MW failure will not increase risk of widespread grid failure.
- Common market with Albania and Implementation of Energy Strategy 2017-2026 program which includes construction of 200 MW flexible unit will ensure system power reserves to maintain the system balance in real time.
Integration of RES in the transmission system

RES application for connection in KOSTT:

- **WP KITKA**, 32.5 MW (under construction/2018 in operation)
- **WP SELACI** 105 MW (in process/Connection agreement)
- **WP Koznica** 34.5 MW (in process/Connection agreement)
- **WP Budakova** 46 MW in process/connection offer
- **WP Zatriqi** 64.8 MW in process/connection offer
- **WP Kamenica 1 and 2**, 76.8 MW (In process/connection offer)
- HPP Lepenci 10 MW/ under construction
- SOLAR PARK 9 MW “Bejta Commerce” (process/connection offer)
**Integration of RES in the transmission system**

**Support factors for RES Integration**
- Reliable and secured transmission network
- Priority in dispatching
- KOSTT manages RES Found through Market Operator
- Feeding Tariffs (for 150 MW wind, 240MW HPP, 14 MW Biomass, 10 MW Solar - 12 years)
- Market integration with Albania and next step integration in regional market

**Constrains factors for RES Integration:**
- Lack of power reserves,
- Inflexible TPP units and age and technical condition of existing TPP
- no energy storage facilities or flexible units such a pump storage units

**Connection application up to the date:**
- Wind = 360 MW,
- Solar= 9 MW,
- HPP=10 MW
Technical operational affair related to Albanian- Kosovar Market Coupling

Prishtine 2018
Market Opening- Law obligation (2016)

- Deregulation of Wholesale market
- Retail market deregulation in phases
- Generators to offer their capacities in open market to all market participants
- MO will manage RES found and will pay RES generators
- Market based purchase of Grid Loses
- Organization of Day Ahead market

Based on law obligation ERO issued Guidelines for market opening starting from 1st of April 2017
Balancing mechanism (BM)

- Operates as a contract between TSO and Trading Parties for delivery of power (not energy)
  - Payment is for energy delivered with that power.
- From 1\textsuperscript{st} October 2016- 31\textsuperscript{st} May 2017 was implemented as dry run with no financial impact.
- From 1\textsuperscript{st} June 2017 BM is in real operation
- There are lack of national balancing reserves
- Procedures for cross border procurement of services are developed.
RES Energy Found

- From 1st Jun 2017 KOSTT MO manages RES energy Found
- RES Generator Sells to MO their production regulated incentive price (feed-in tariff)
- MO Sells to Suppliers proportionally to their demand with referent market price.
- MO charges Supplier to cover price difference RES tariff
- RES generator are charged for 25% of imbalances for both direction (being long or short)
- RES generator nominates their production at D-1. they have the right to re nominate every three hours in advance
Grid Losses

- From 1\textsuperscript{st} April 2017 Transmission and distribution Grid losses are purchased at deregulated price in the open market.
- Part of grid losses are purchased from KEK generation with contracted Price.
- KOSTT signed with cross border traders who are operating in Kosovo market the framework contract for purchasing grid losses.
- From 1\textsuperscript{st} September 2017 KOSTT is organizing auction on D-1 for purchasing part of losses not covered by KEK generation.
Establishment Common Market KS-AL

- As first step common Power exchange with Albania
- KOSTT will be shareholder of ALPX
- Expected to joint on 2019
- Adaptation of regulation and Market design and market is needed
- Stepwise volume of energy will be traded through ALPX
- Business plan and decision are in process recently for approval
Common Electricity Market

- Common market of Kosovo and Albania in line with EU target model – objective of Energy community
- a single bidding zone in all markets’ timeframes
  - interconnections KS-AL will be considered as internal lines
  - No capacity booking or scheduling requirement
- would be coupled with other zones on the day ahead and intraday markets
- cross-border capacities with other zones would be allocated in line with the Forward Network Code
- The generation mix would allow generators to optimize their generation portfolio
- will link a hydro-based system of Albania with a lignite-based system of Kosovo
Critical milestones of Market Coupling

• Legislation
  – Outline changes to national laws covering establishment of a regulatory committee and recognition of licenses issued by either ERO or ERE
  – Implementation of national law changes

• Regulators and licensing
  – Establishment of the Common Market Regulatory Committee
  – Development of the SO and MO licenses
  – Development of Price Control framework for SO and MO
  – Establishment of Market Rules Modification Committee
  – Development of procedure for allocation of congestion costs

• Transmission and communication infrastructure
  – Operating of new 400 kV interconnection line Kosovo – Albania
  – List of needed internal network reinforcements, especially in Albania
Critical milestones of Market Coupling

• **Market model**
  – Development of high level market design for Common Market
  – Development of market rules for Common Market
  – Establishment of communication and billing procedures between the SO and the MO for operation of a balancing mechanism and for charging for ancillary services and other commercial payments
  – Establishment of procedures for trading participant registration (plus registration of service providers such as distribution network operators)
  – Establishment of Metering Administration Agents in Kosovo and Albania
  – Establish procedures for registration of customer transfers between supplier licensees

• **System operation**
  – Commissioning of new fiber optic data link and data exchange protocols
  – Setting up common dispatching center and eventual regional network control centers
  – Adoption of common system operation responsibilities, including power system control, maintenance, construction and development
  – Transition from two separate systems operation and control to common, single system operation and control mechanism
Technical benefits from joint operation of Kosovo and Albanian Power Systems

- Power System optimisation (utilisation of base power from TPP and flexible power from HPP)
- Reduction of system power reserves and their costs
- Improvements of generation and system adequacy
- Improvements of security of supply
- Support for RES integration in Power System
- Better utilisation of new interconnection 400 kV and 110 kV (Connection to SS Kuksi)
Impact of Joint operation Kosovo and Albania (CB KS+AL) on system power reserves

- The integration of Kosovo-Albania market enables proportional reduction of regulatory reserves for both systems.
- If two systems are integrated, i.e. if two CA (Control Areas) create a Control Block, then the needs for tertiary reserve remains the largest unit in the block.
- Replacement reserve or so called tertiary reserve will be reduced proportionally for each CA in relation with largest unit operating I CB.

![BALANCING INTEGRATION STEPS](image-url)
Connection agreement KOSTT-ENTSOE

- KOSTT signed CA with ENTSO-E in good faith being aware that condition on Elektrosever licensing is beyond KOSTT’s mandate

- For one year this condition has blocked KOSTT to start operation as control area/block

- Non implementation of CA/CB disables KOSTT to:
  - Fulfil commitments of WB6 MoU by Kosovo for regional market integration & balancing
  - Utilize 400kV line and LFC project
  - Joint establishment of PX Kosovo Albania
  - Receiving services from SEE CAO and RSC
  - Market signals for investment
Revenue from Congestion management /Capacity allocation collected by EMS from KOSTT interconnectors

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (€) (AL-MN-MK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1.212</td>
</tr>
<tr>
<td>2009</td>
<td>4.184</td>
</tr>
<tr>
<td>2010</td>
<td>3.873</td>
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<td>2011</td>
<td>2.883</td>
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<td>2012</td>
<td>5.892</td>
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<tr>
<td>2013</td>
<td>6.708</td>
</tr>
<tr>
<td>2014</td>
<td>9.813</td>
</tr>
<tr>
<td>2015</td>
<td>4.473</td>
</tr>
<tr>
<td>2016</td>
<td>2.759</td>
</tr>
<tr>
<td>2017 (Jan-Sept)</td>
<td>9.70</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50.285</strong></td>
</tr>
</tbody>
</table>

New 400 kV line with regional importance out of operation since June 2016
Thank You!

Transmission System and Market Operator
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