



ESMAP Knowledge Exchange & Study Tour on Grid Digitalization and Cybersecurity in Italy

May 20 - 27

📍 Italy

COUNTRY SPOTLIGHT



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RWANDA



Rwanda

- ❖ Location: East of Africa
- ❖ Capital: Kigali
- ❖ Area: 26,338 km²
- ❖ Climate: Moderated Tropical Climate (21°C to 27°C)

Country of Thousand Hills



Project Development



Energy Development Corporation Ltd



Holding Company

Group Management, Coordination, Monitoring and Evaluation, & Audit



Energy Utility Corporation Ltd

Utility Operations
(Commercial and Network Maintenance)



- General power system planning
- Energy infrastructure projects development (generation and transmission, Distribution and Acces)
- Electricity roll-out program
- Primary energies (oil, biomass)
- Social energies (off-grid systems, biogas,...)
- Venturing into domestic and regional ventures



- Power generation and bulk purchase from IPPs
- Operation and maintenance of Government-owned Power Plants
- Bulk power transmission
- Power distribution
- Network Operation and maintenance
- Retail of electricity
- Consumer relation & demand side management



Key initiatives in the digitalization roadmap

Smart Metering Infrastructure:

- Reduced electricity theft, Improved revenue collection, Accurate billing, Better demand forecasting, Faster outage detection

SCADA and Distribution Management Systems

SCADA (Supervisory Control and Data Acquisition)

- Energy Management Systems (EMS)
- Distribution Management Systems (DMS)
Real-time grid monitoring, Remote switching, Fault isolation, Voltage management, Automated control operations.

GIS and Network Mapping:

- Map customers and infrastructure, Track transmission lines, Plan network expansion and Improve maintenance operations.

Key initiatives in the digitalization roadmap

- Integrated Business Management Systems (ERP & CMS)
- A local vending system serving all off our prepaid customers through digital payment (USSD code, Mobile Apps & Banks)
- Use of Advanced Metering System (AMI 2.0) with key component such as Metering System (MS), Meter Data Management (MDM) and Head End System (HES) as key components.

Success Stories

- Improved service delivery
- Improved company performance
- Transmission network availability at 99.7%
- Reduced losses
 - Currently at 16.3% when it was above 22% in 2017
- Increased customer base (over 1.76M currently)
- Zero tolerance for corruption



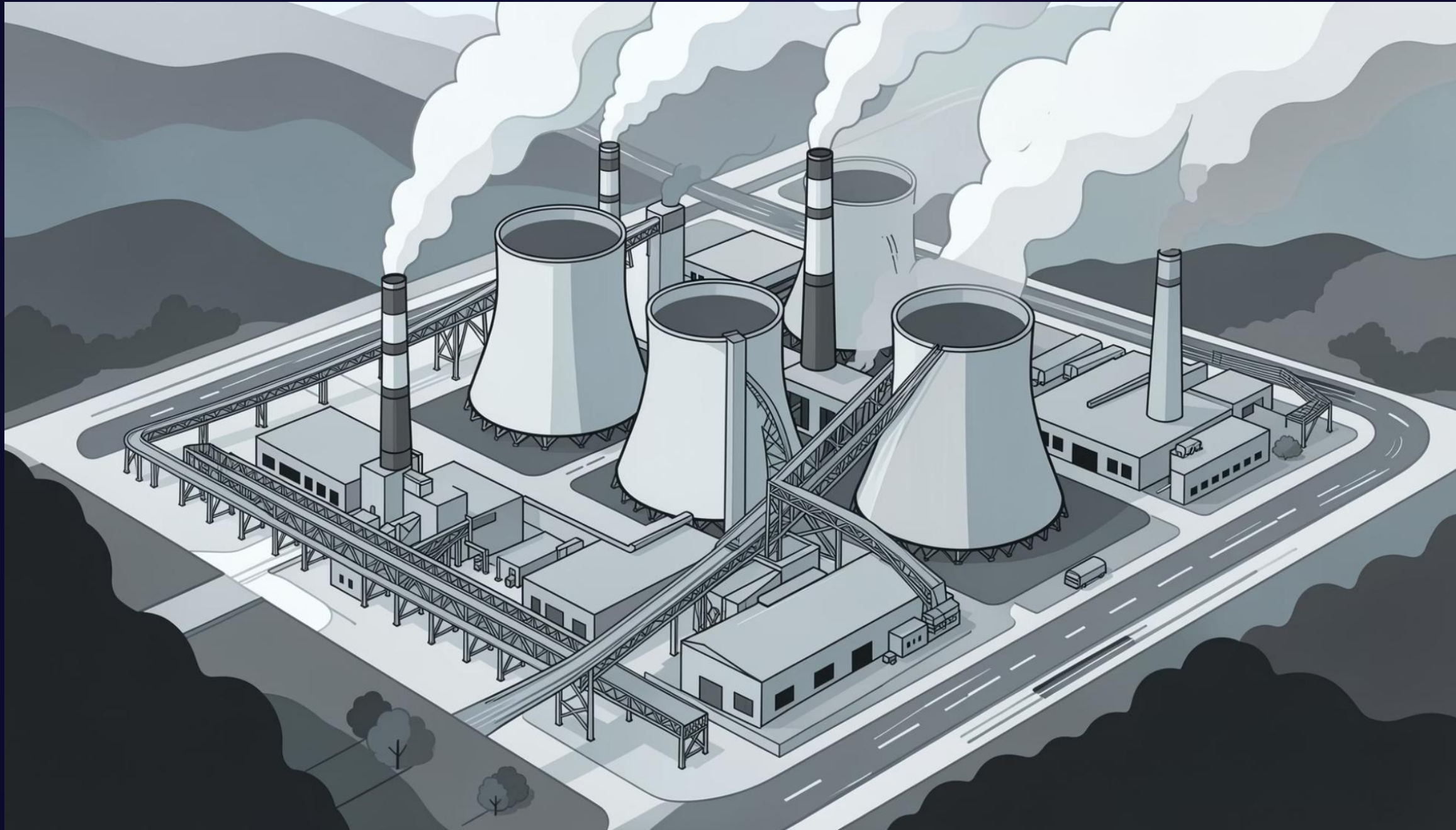


KOSTT Digital Transformation

KOSTT / Grid Digitalization & Cybersecurity
Knowledge Exchange (Italy)

May 2026

Introduction to Kosovo's Power System



Generation Mix

Kosovo's power system is heavily dependent on lignite-based thermal power plants, which account for approximately **88%** of total generation. Renewable Energy Sources (RES) contribute the remaining **12%**.

Key System Parameters

- **Peak Demand:** 1624 MW
- **Annual Energy Demand:** 6.87 TWh
- **Control Block:** Integrated with Albania (OST) since 2020 within the European Synchronous Area
- **Interconnections:** Four 400 kV and two 220 kV lines connecting all neighboring TSOs

KOSTT — Key Infrastructure Data

Total interconnection capacity across
4×400 kV and 2×220 kV lines

5800 MVA

High-voltage network spanning
400 kV, 220 kV, and 110 kV circuits

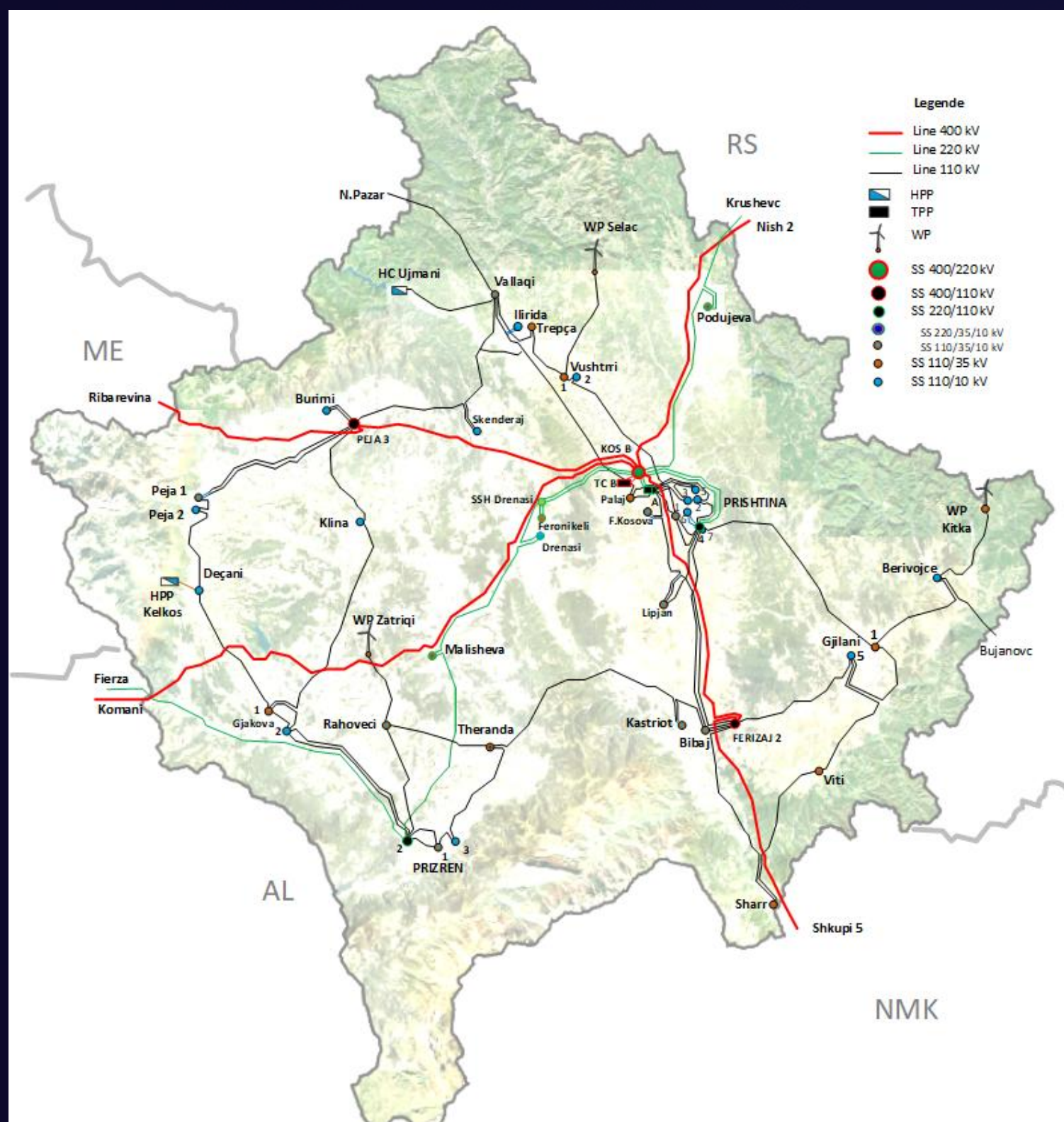
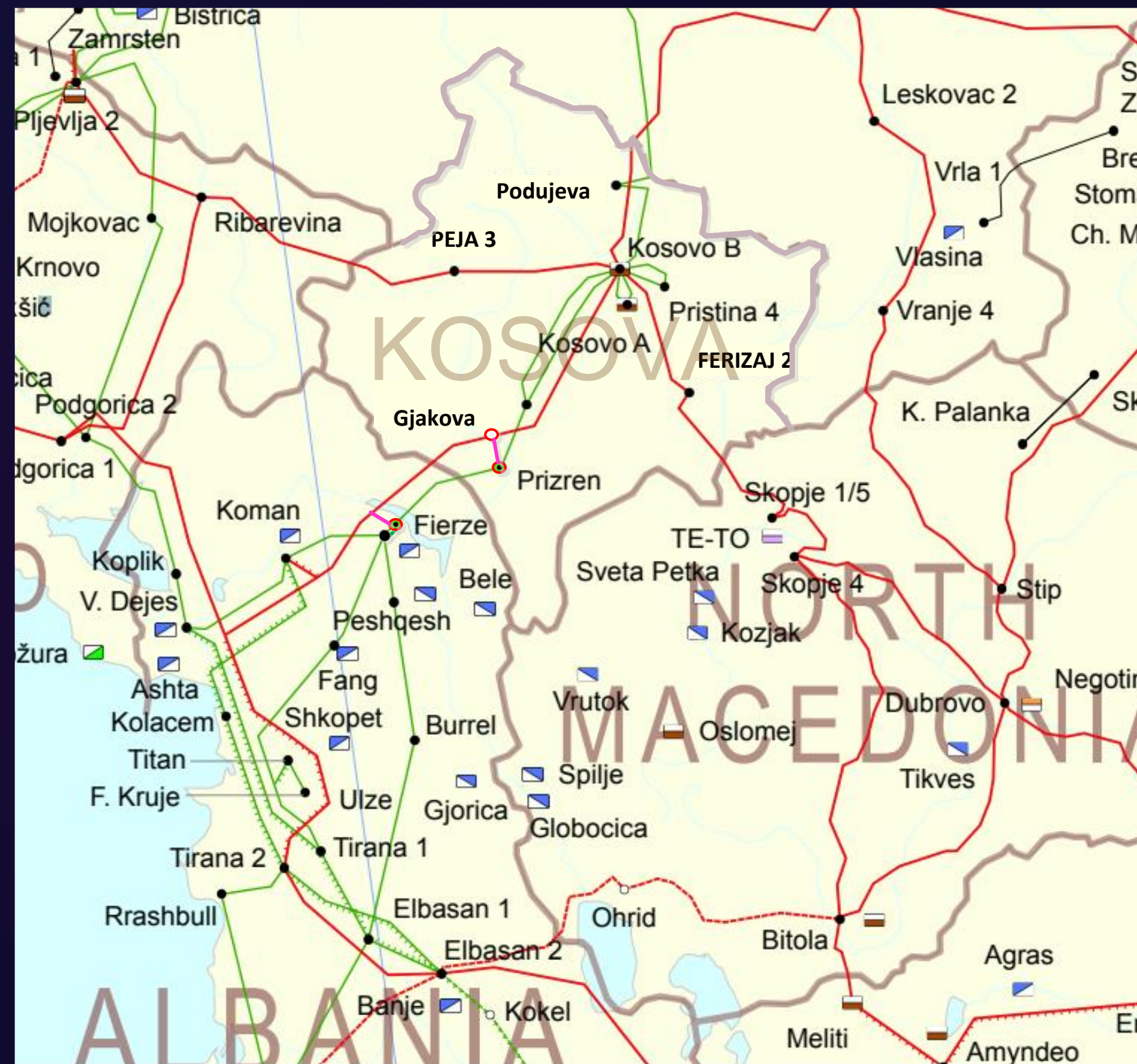
1437 km

Optical ground wire supporting
SCADA, measurement, and
protection systems

1200 km

Substations
400 kV, 220 kV, and 110/X kV

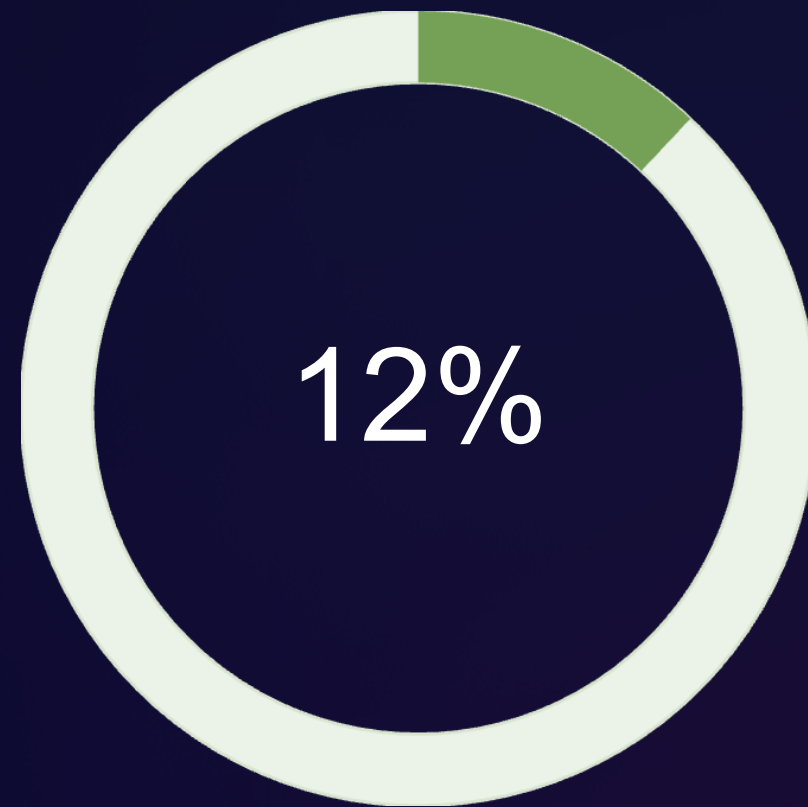
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Kosovo Transmission Network map

Kosovo's Energy Strategy 2022–2031

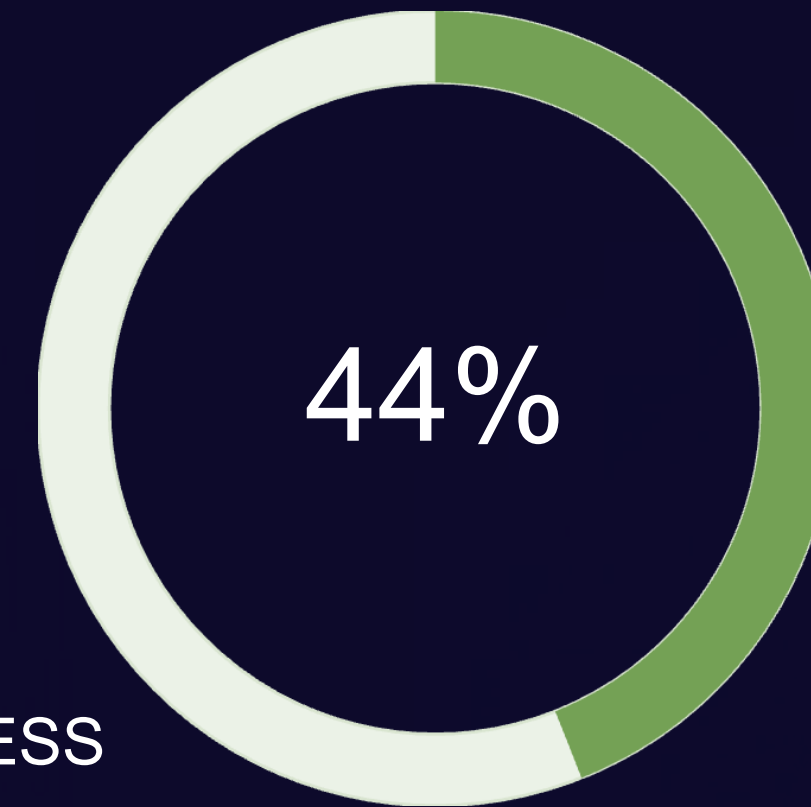
Y-2025
137 MW wind
132 MW HPP
30 MW PV
900 MW TPP



Current RES Share 2026 (Energy)

Renewables today — primarily hydro, wind and small solar

Y-2031
737 MW wind
132 MW HPP
610 MW PV
100 PV Prosumers
20 MW Biomass
720 MW TPP
170MW/340MWh BESS



Target RES Share 2031 (Energy)

Ambitious 2031 target aligned with EU energy transition goals

Enabling the Transition: 170 MW / 340 MWh BESS

A Battery Energy Storage System will be critical to integrating high levels of variable renewable generation. The BESS will support:

→ aFRR

Automatic Frequency Restoration Reserve (secondary regulation)

→ mFRR

Manual Frequency Restoration Reserve (tertiary regulation)

→ Energy Arbitrage

Store low-cost generation, dispatch during peak demand

→ Black Start

Critical restoration capability for system recovery

KOSTT Digital Transformation Journey

Building a Future-Ready Operational Backbone



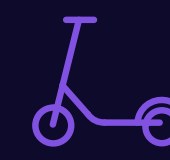
SCADA/EMS Modernization

Upgrading the supervisory control and data acquisition and energy management systems for enhanced grid visibility and control.



Telecommunications Transformation

Implementing advanced telecommunication solutions to support critical grid operations and data exchange.



Substation Automation

Automating substation functions for improved reliability, efficiency, and remote management capabilities.



Digital Substations Roadmap

Developing a strategic roadmap for the integration of fully digital substations, embracing IEC 61850 standards.



Electricity Market Digitalization

Digitalizing electricity market operations to foster greater efficiency, transparency, and regional integration.

Modernization of Core Operational Infrastructure

SCADA/EMS • Telecom • Local SCADA



New National SCADA/EMS Platform

Implementing a state-of-the-art SCADA/EMS platform to centralize control, optimize energy flow, and enhance system stability across the national grid.

Migration Towards MPLS-TP / IP-MPLS

Upgrading the telecommunication backbone to MPLS-TP and IP-MPLS technologies for secure, high-speed, and reliable data transmission.

Local SCADA Modernization in Substations

Modernizing local SCADA systems within substations to enable advanced automation, data acquisition, and seamless integration with the central EMS.

Enhanced Operational Resilience

Strengthening the grid's ability to withstand and recover from disturbances through robust and redundant digital infrastructure.

Future Smart Grid Readiness

Laying the foundation for advanced smart grid functionalities, including distributed energy resource management and demand-side response.

Strategic Partnerships Supporting Digitalization

Integrated Infrastructure and Digital Modernization



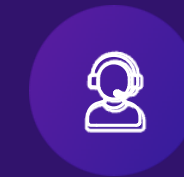
KfW / EU / KOSTT Investment Program

A collaborative funding initiative driving significant investment into critical infrastructure upgrades and digital transformation projects.



AFD & RTE International Cooperation

Leveraging international expertise and best practices from leading transmission system operators to accelerate our digitalization efforts.



Digitalization Roadmap and IEC 61850

Developing a comprehensive digitalization roadmap, with a strong focus on adopting the IEC 61850 standard for substation automation.



Approx. EUR 31 Million Modernization Program

A substantial financial commitment dedicated to modernizing our grid infrastructure and digital systems.



ENTSO-E Alignment Support

Ensuring our systems and processes align with European Network of Transmission System Operators for Electricity standards for seamless regional integration.

Towards Digital Substations & Smart Grid Readiness

Long-Term Digitalization Vision

IEC 61850-Oriented Architectures

Designing substation architectures based on the international standard for communication networks and systems in substations, ensuring interoperability and future-proofing.

OT/IT Convergence

Integrating operational technology (OT) with information technology (IT) to create a unified and efficient infrastructure for grid management.

Cybersecurity-by-Design

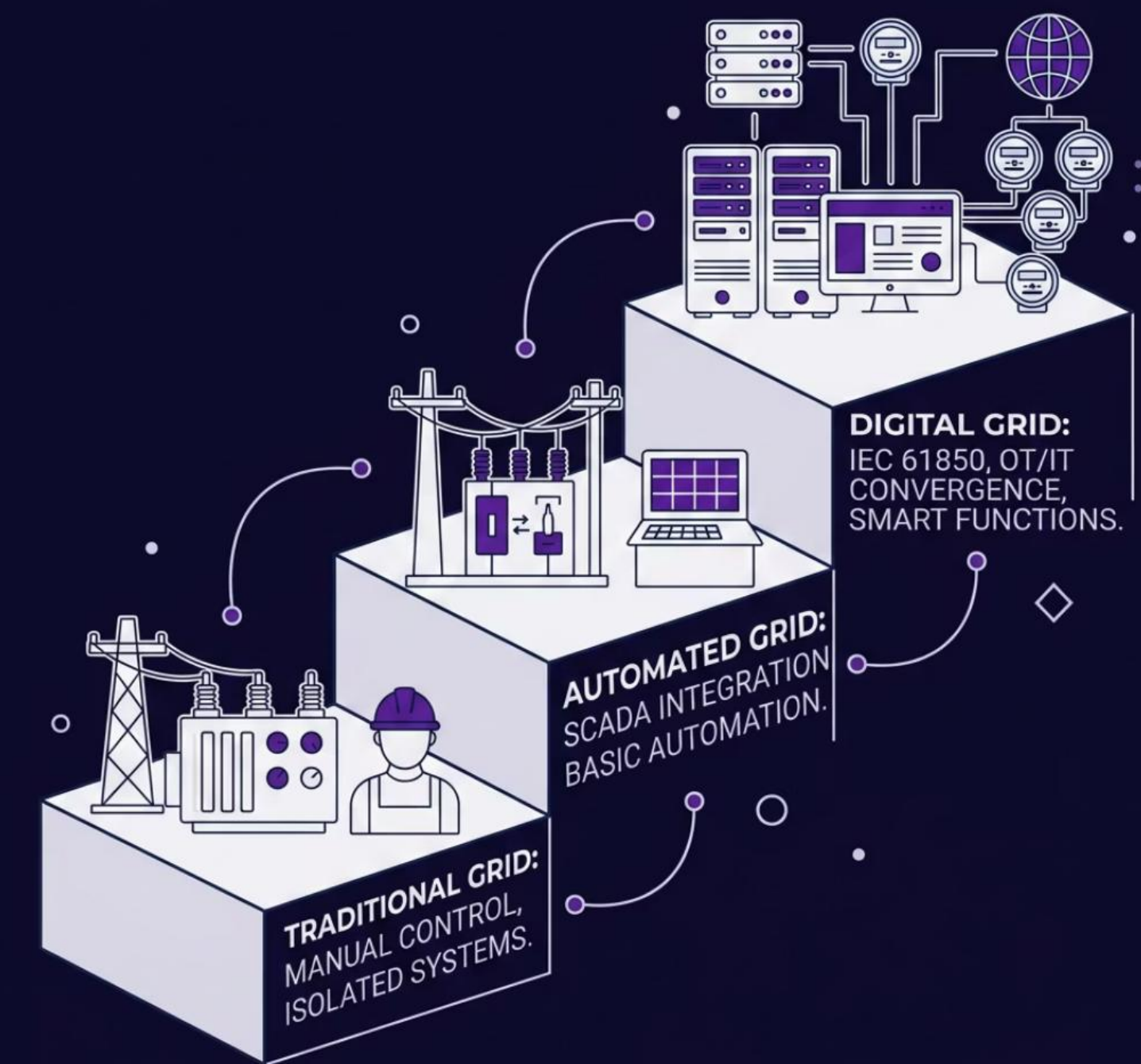
Embedding robust cybersecurity measures into every stage of system design and implementation to protect critical infrastructure from evolving threats.

Pilot Digital Substation Initiative

Launching a pilot project to test and validate the implementation of a fully digital substation, gathering insights for broader deployment.

Renewable Integration Readiness

Preparing the grid to seamlessly integrate a growing share of renewable energy sources, supporting a sustainable energy future.



Electricity Market Digitalization

EBRD-Supported EMMS Initiative



1

Automated Market Workflows

Streamlining and automating complex market processes, from bidding to settlement, reducing manual intervention and errors.

2

Centralized Market Data Management

Establishing a single, secure repository for all market data, ensuring consistency, accessibility, and integrity.

3

Real-Time Monitoring and Reporting

Providing continuous oversight of market operations with instant data analytics and comprehensive reporting capabilities.

4

Enhanced Transparency and Compliance

Increasing visibility into market activities and ensuring adherence to regulatory requirements through digital record-keeping and audit trails.

5

Regional Market Integration Readiness

Facilitating seamless participation in broader regional electricity markets, enhancing liquidity and cross-border energy exchange.