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# Grid integration of variable renewable energy sources in the Kosovo Power System

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[WWW.KOSTT.COM](http://WWW.KOSTT.COM)



# General energy planning framework

- Energy Strategy 2017-2026
- Law of Energy and Electricity
- Law on Energy Efficiency.
- National Development Strategy 2016-2021
- Technical Grid Codes (transposing ENTSO/E Codes)
- Market rules and Market design;
- Implementation of “soft measures” according to the EnC guidelines.

## Electricity Demand Forecast

- Based on ERO Procedure for preparing Short and Long Term Electricity Balance
- Demand forecast model (Down to top approach/excel format)
- Input Data: historical and forecasted (GDP, Industrial, Household, Commercial and Transport demand, transmission and distribution losses, national program for efficiency of energy use, etc)

## New Generation Capacity Forecast

- Input Data: existing and forecasted new generation capacities, peak load and season loads
- Generation Adequacy model ( Based on ENTSO/E methodology)
- Generation Adequacy Forecast
- System Adequacy Forecast (PSS/E System Studies/ 10 Year TNDP)

# Representation of renewable energy in generation capacity expansion planning tools

## Planning Process

- Transmission network development plan based on Grid Code Requirements (PSS/E tool)
- RES applications for Connection in the Transmission grid including:
  - Proposed Location, Starting Date, Capacity and type, steady state and dynamic PSS/E models of RES Project, wind, solar radiation and hydrological data (at least one year/hour data)
- System Impact Studies of Connection Application of each RES based on Grid Code Requirements including:
  - Power Flow, Short Circuit and Transient simulations, generation adequacy assessment(impact on system power balancing)
  - Connection Configuration in to the Transmission grid and Transmission reinforcements when is needed (based on Connection Charging Methodology)
- Connection offer (including cost of the new transmission connection assets/Deep Connection approach)
- Connection Agreement with KOSTT and PPA with KOSTT (Market Operator)

### **Rights and obligations of RES admitted to the Support Scheme**

- Entitled to sell their production to the MO through a PPA for a period of 10 to 12 years, depending on the technology, with Feed-in Tariff price;
- Liable for 25% of their total imbalance costs;
- Priority in examining the application for connection to the relevant system;
- Entitled to priority dispatching;
- RES generator nominates their production at D-1, entitled to re nominate every three hours in advance.
- Any future changes of the Feed-in Tariff shall not affect the RES generators admitted to the Support Scheme.

### **Renewable Energy Fund**

- REF funding provided through a Renewable Energy Charge applicable at transmission level to all suppliers of electricity in Kosovo.
- REF finances the costs associated with:
  - The difference between the Reference Price and the Feed-in Tariff;
  - The compensation for the imbalance costs;
  - Costs incurred by MO in managing and operating the REF and any other costs necessary, if so decided by ERO

# Network analysis (RES capacity and energy data)

RES Capacities	Actual Installed Capacities [MW]	Planned Capacities 2019-2028 (High Scenario) [MW]	Planned Capacities 2019-2028 (Base Scenario) [MW]
HPP	92	240	240
Wind Power	34	250	180
Solar	6.6	121	85
Biomass	0.0	16	14

- **Advantages of RES integration**

- Reliable and secured transmission network
- Priority in dispatching
- KOSTT manages RES Found through Market Operator
- Feeding Tariffs (for 150 MW wind/85€/MWh, 240MW HPP/63.3€/MWh, 14 MW Biomass/71.3€/MWh, 10 MW Solar (136.4 €/MWh - 12 years))
- Lack of electricity in region

- **Constrains of RES integration**

- 97% of produced electricity is from TPP (un-flexible units)
- Lack of system regulation reserve
- No flexible units which can balance the intermittent power from RES
- Slow development of regional market