



# Drina Nexus Assessment

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# SOLUTIONS CLUSTERS



(Co-)optimizing hydro power plants operation.



Promoting rural development



Improving water quality and management of solid waste

# (CO-)OPTIMIZING HYDRO POWER PLANTS OPERATION



## Key challenges

1. *Limited cooperation among countries on the operation of dams.*
2. *Expansion of hydropower in the basin and implications to the flow regime and downstream uses.*
3. *Environmental flow regulation and impacts to electricity production.*

# (CO-)OPTIMIZING HYDRO POWER PLANTS OPERATION



## Key challenges

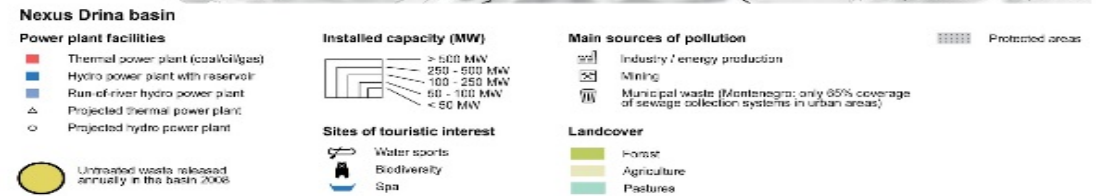
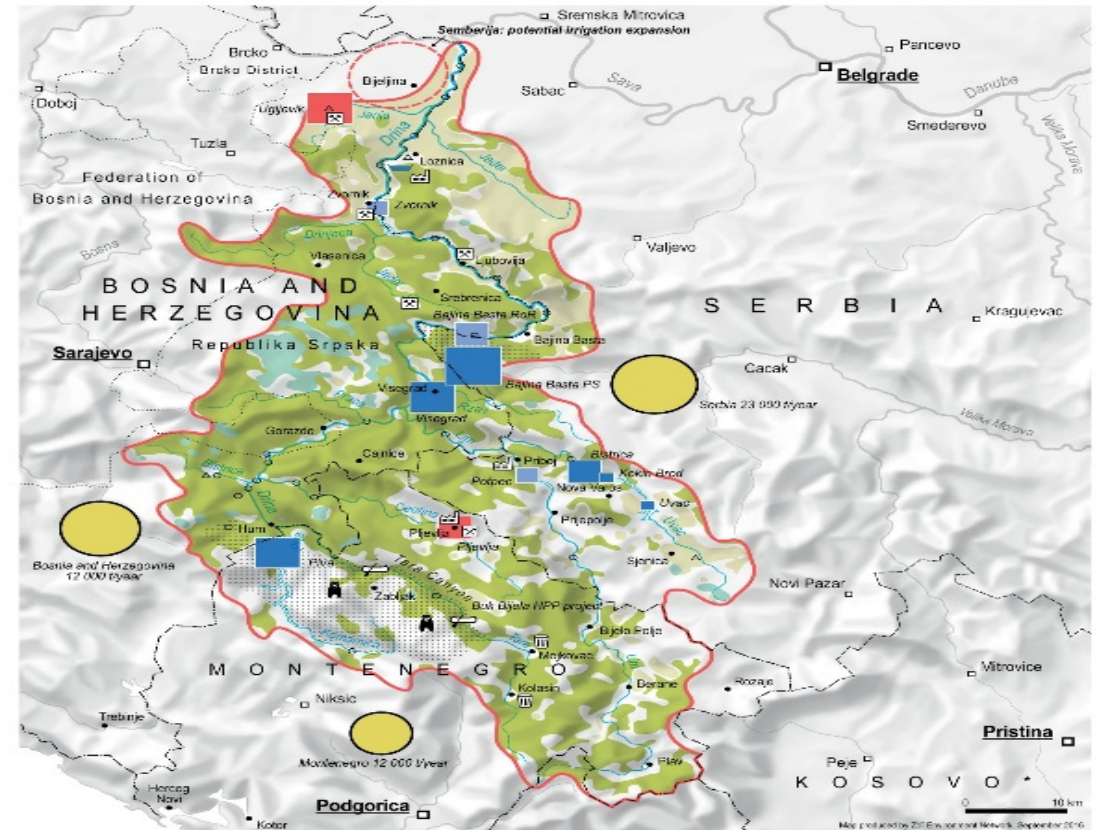
4. *Organizational shortfalls that affect development opportunities:*
  - *investments in non-hydro RES,*
  - *energy efficiency,*
  - *and the regional electricity trade.*

# (CO-)OPTIMIZING HYDRO POWER PLANTS OPERATION

## Suggested solutions

*This analysis focused on quantifying the benefits of:*

- Improving the cooperation in the operation of dams and hydropower plants.
- The opportunities generated by electricity trade between the DRB countries and with other neighbouring countries.
- The implementation of energy efficiency measures to reduce the electricity production requirement from hydro and thermal power.



Source: World Bank, Support to Water Resources Management in the Drina River Basin, Final Location Report, 2015. European Environment Agency, Corine Land Cover 2014 (CLC14). Pollution in the Drina River Basin, The Regional Environmental Center for Central and Eastern Europe, 2011. The designation is official projection to political entities, and is in line with UN/EC/OSCE 1994 and the EU. Copied on the Kosovo Declaration of Independence.

# (CO-)OPTIMIZING HYDRO POWER PLANTS OPERATION

## Approach

Developing multi-country model of the three riparian countries (BA, ME and RS) with the focus on Drina river basin, using the **Open Source energy MOdeling SYStem (OSeMOSYS)**.

## Drina Water – Energy Model (DWEM):

### Focus:

- Cost optimal electricity generation to meet the demand.
- Soft linking of water flow in electricity generation system.

Energy System

HPP

Hydrological System

# SCENARIO DESCRIPTION

- **Base scenario (BASE):** representing the non cooperative operation of HPPs in DRB. Upstream HPPs are operated on a single unit base and those downstream are responding to their best.
- **Cooperative scenario (COP):** representing a cooperative planning and operation of all the hydro power plants in the basin.
  - **Increased Trade (COP\_TRD):** explores the opportunities of improving interconnections and trade of electricity.
  - **Energy efficiency (COP\_EE):** investigates the impact of implementing energy efficiency measures on the electricity generation mix.

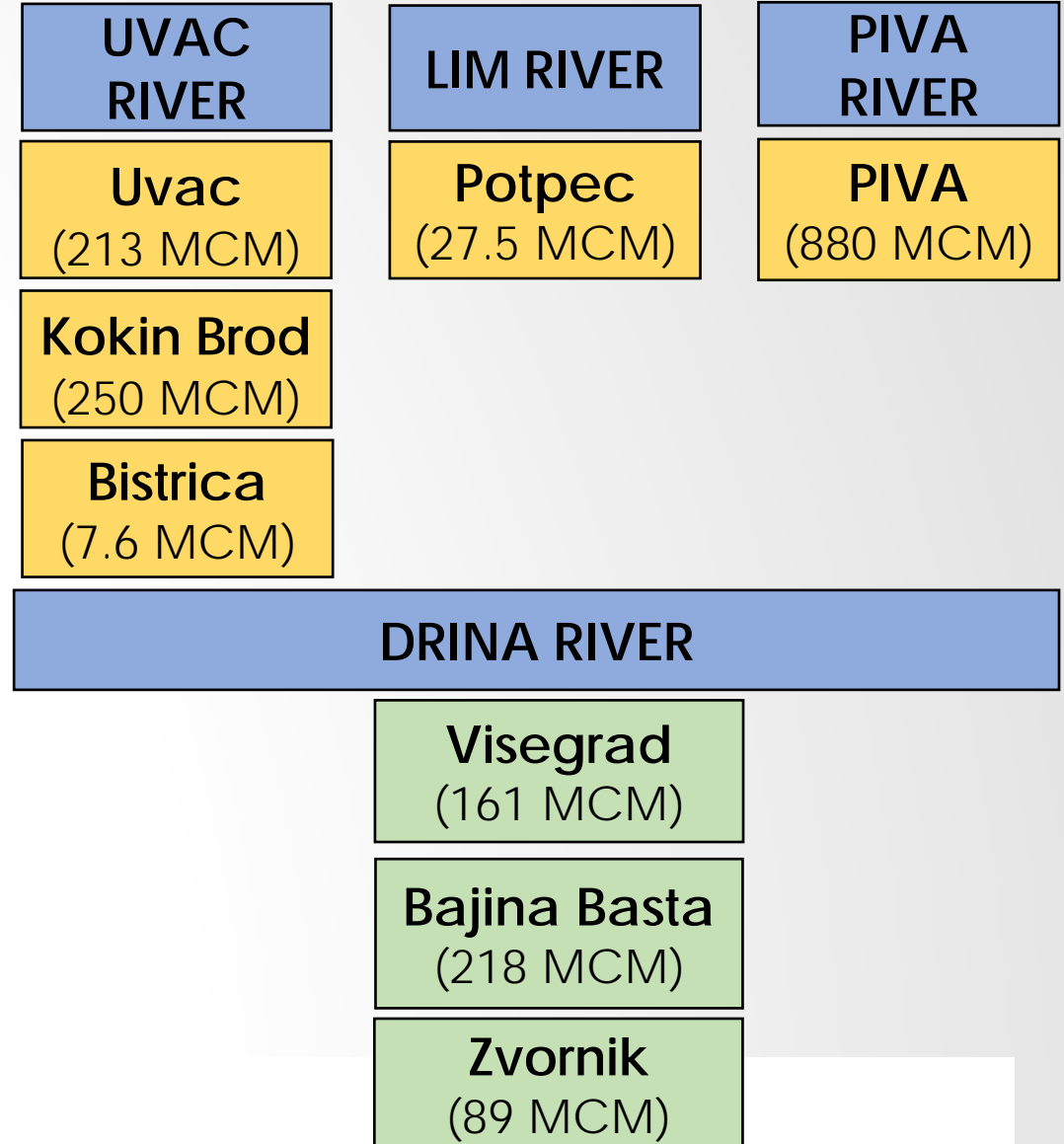
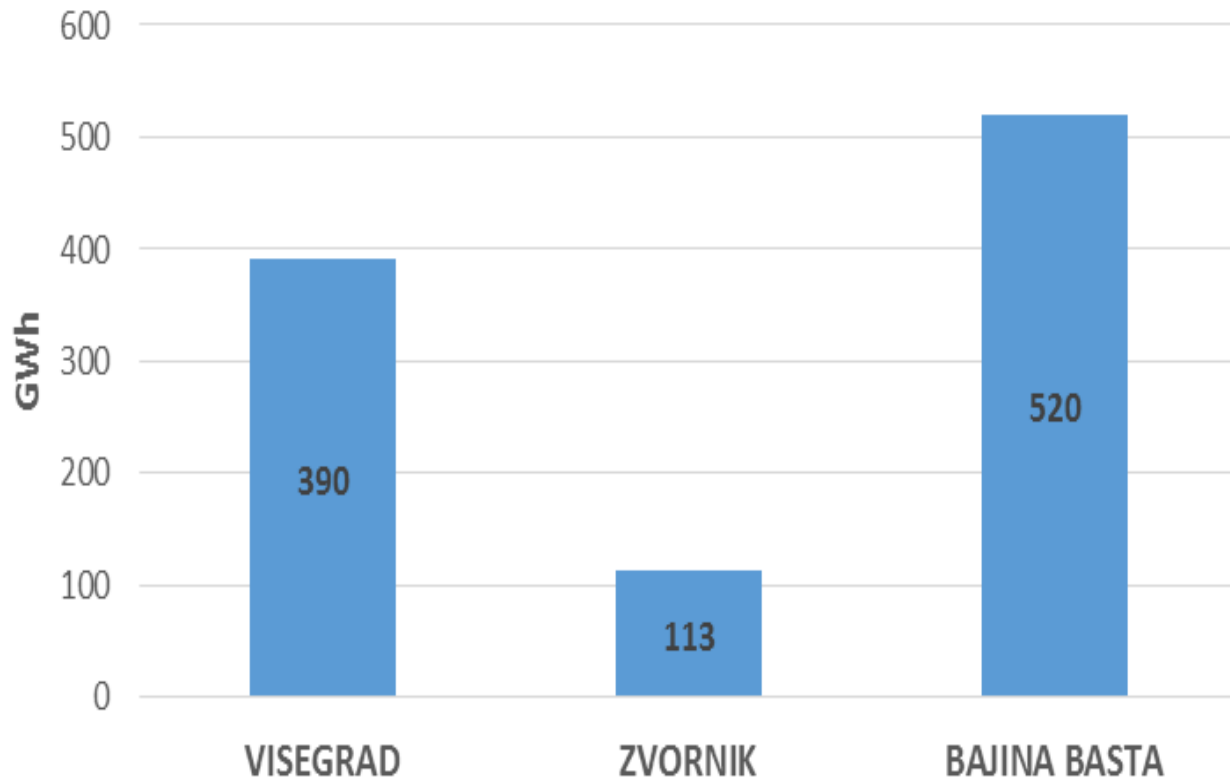


HOW WILL THE **COOPERATION IN HYDRO POWER  
OPERATION** BENEFIT THE COUNTRIES?



# GAINS IN ELECTRICITY GENERATION (COP – BASE)

Cumulative electricity generation gains from  
2017 - 2030

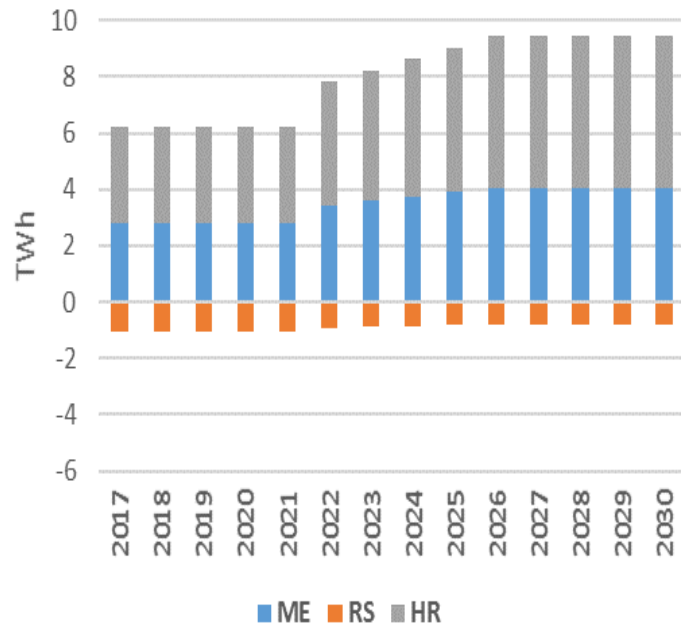


HOW WILL THE SYSTEM BENEFIT FROM **INCREASED  
TRADE OPPORTUNITIES?**

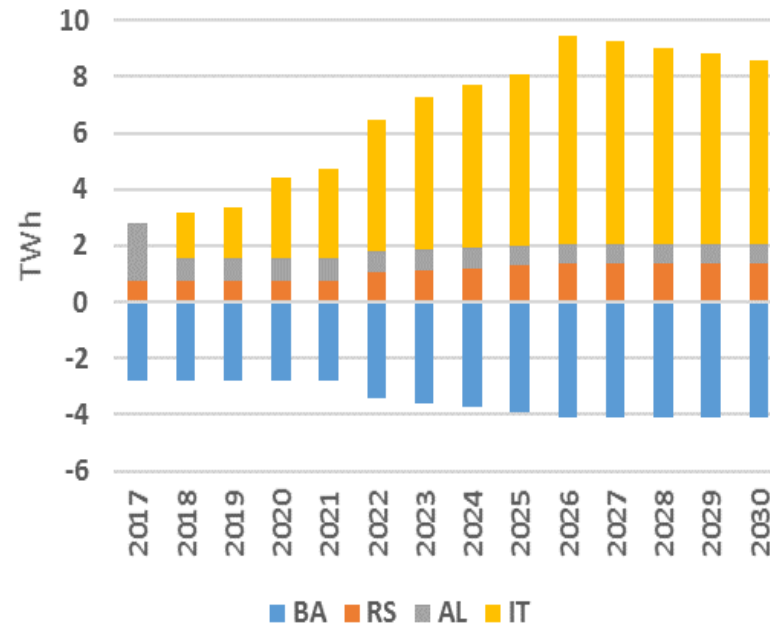


# EXTENDED TRADE SCENARIO (COP\_TRD)

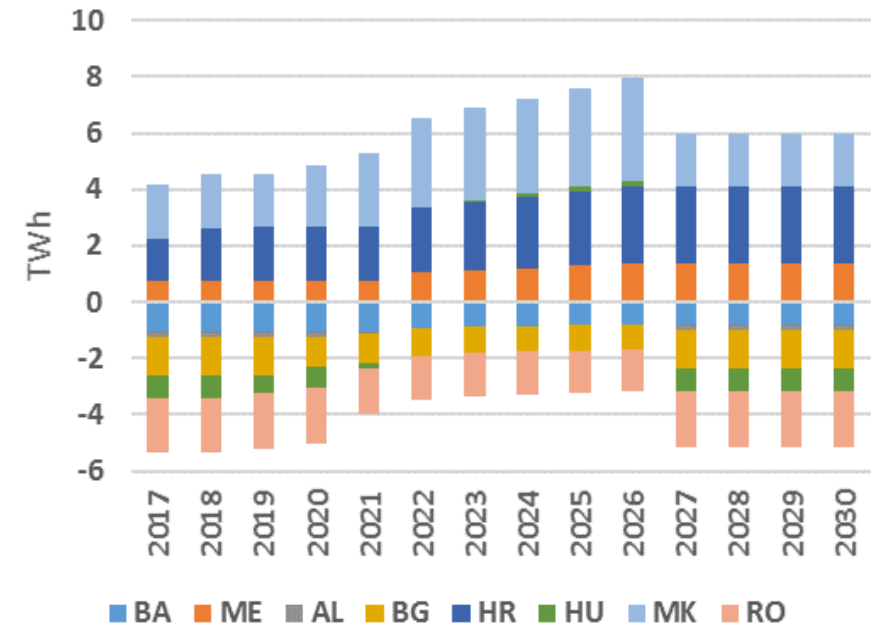
BA net exports - COP\_TRD scenario



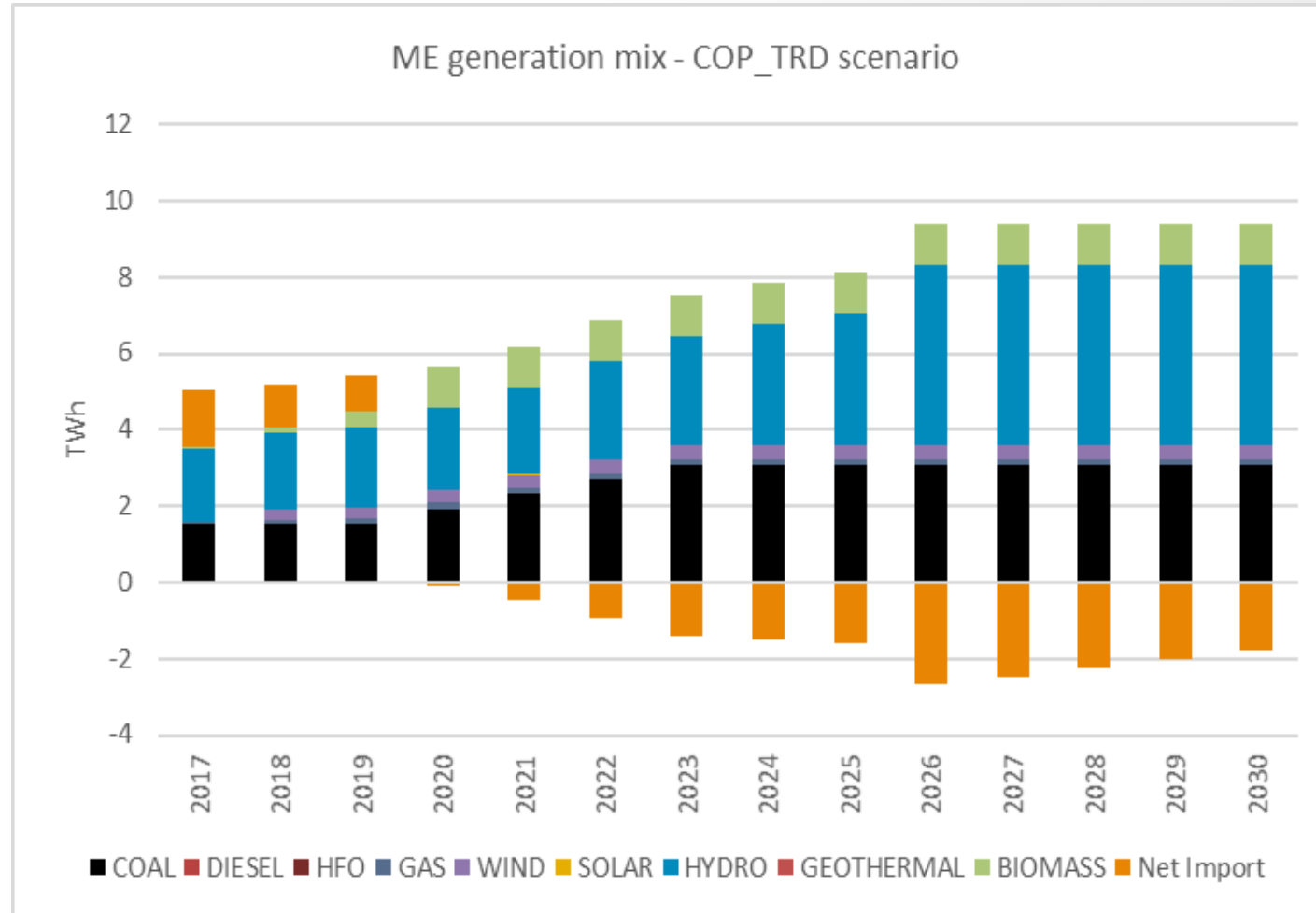
ME net exports - COP\_TRD scenario



RS net exports - COP\_TRD scenario



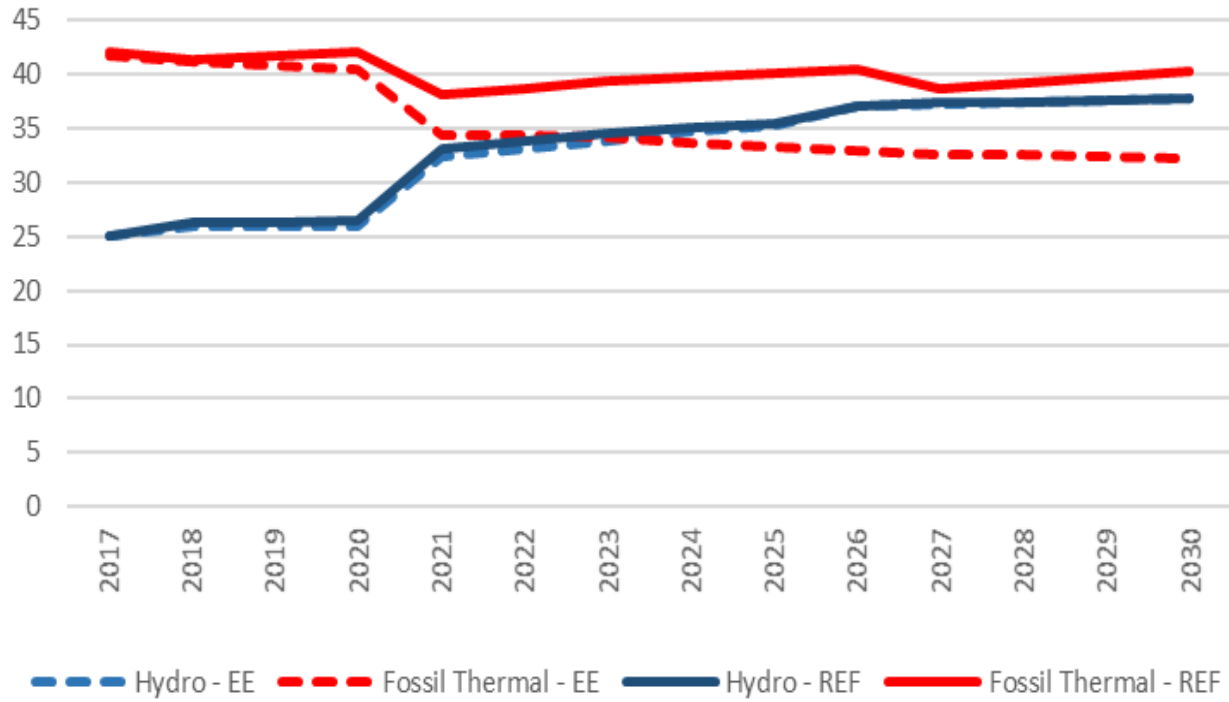
# EXTENDED TRADE SCENARIO (COP\_TRD)



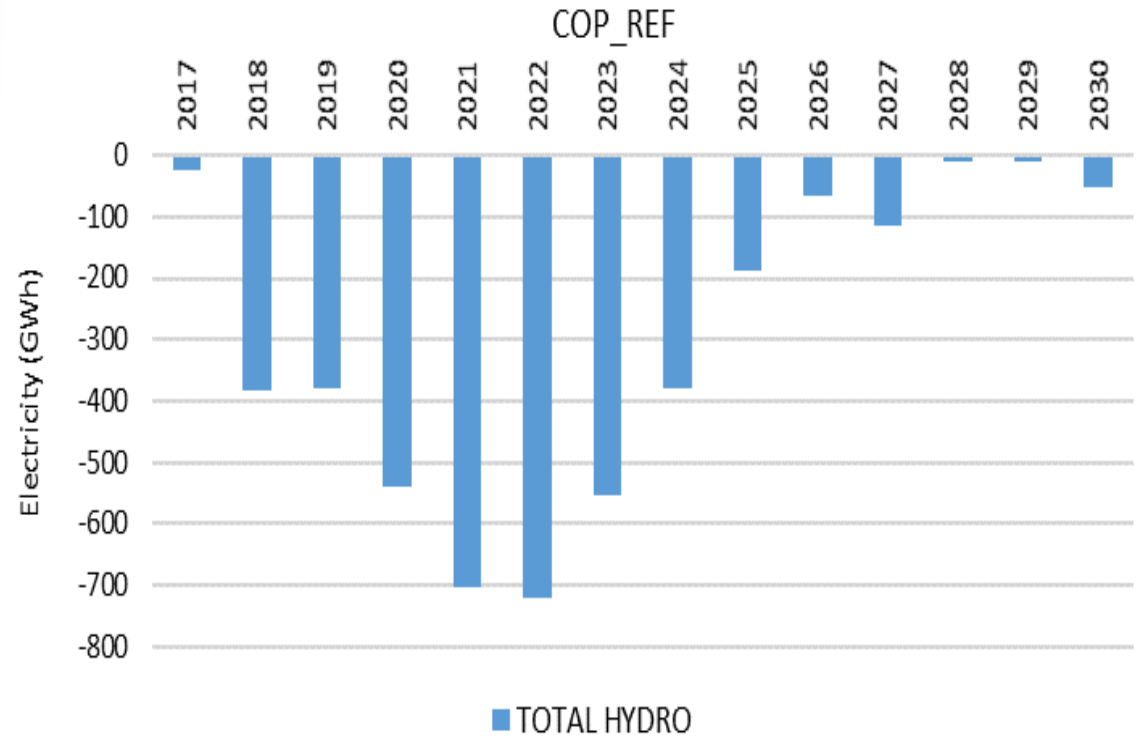
HOW WILL THE SYSTEM BENEFIT FROM **ENERGY  
EFFICIENCY** MEASURES?

# ENERGY EFFICIENCY

Hydro and Thermal generation (TWh)

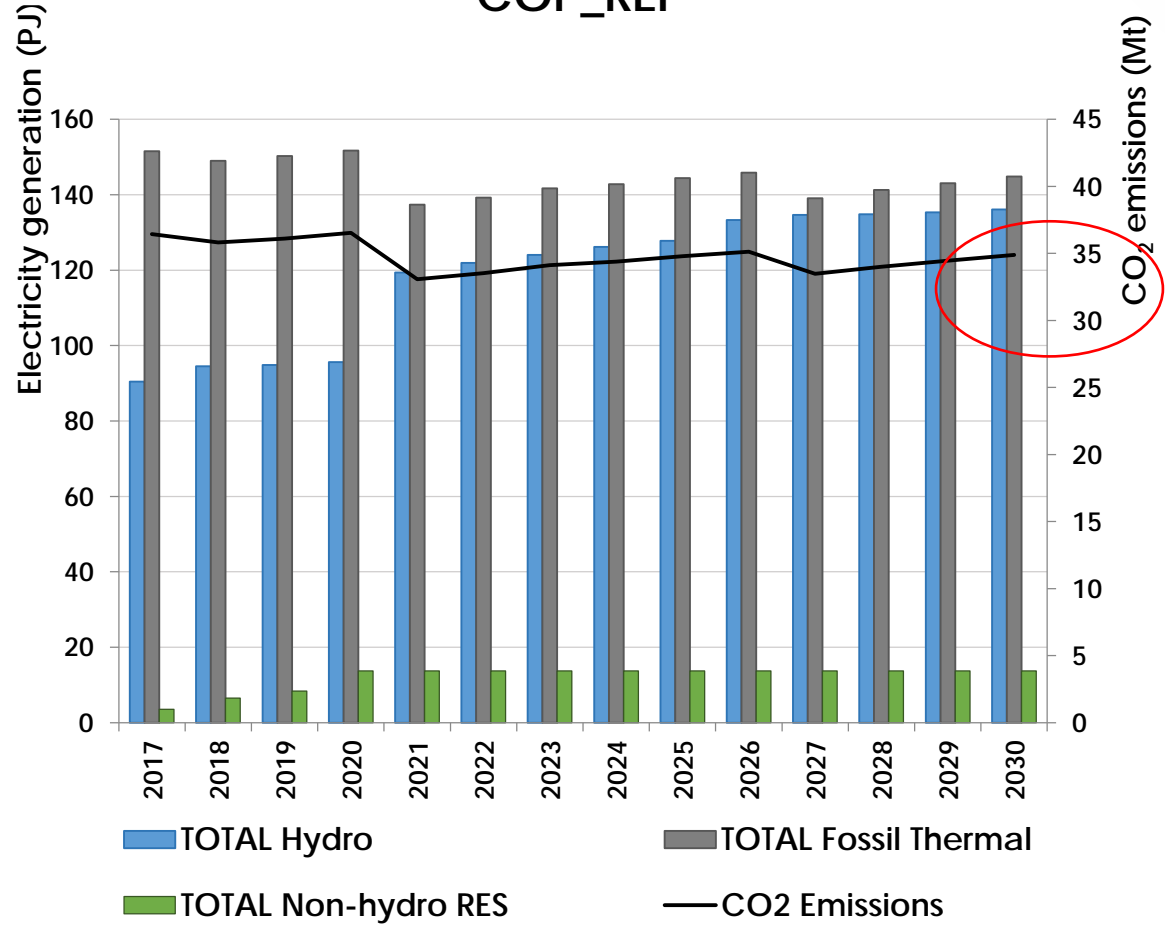


Absolute difference in hydro production between COP\_EE and COP\_REF

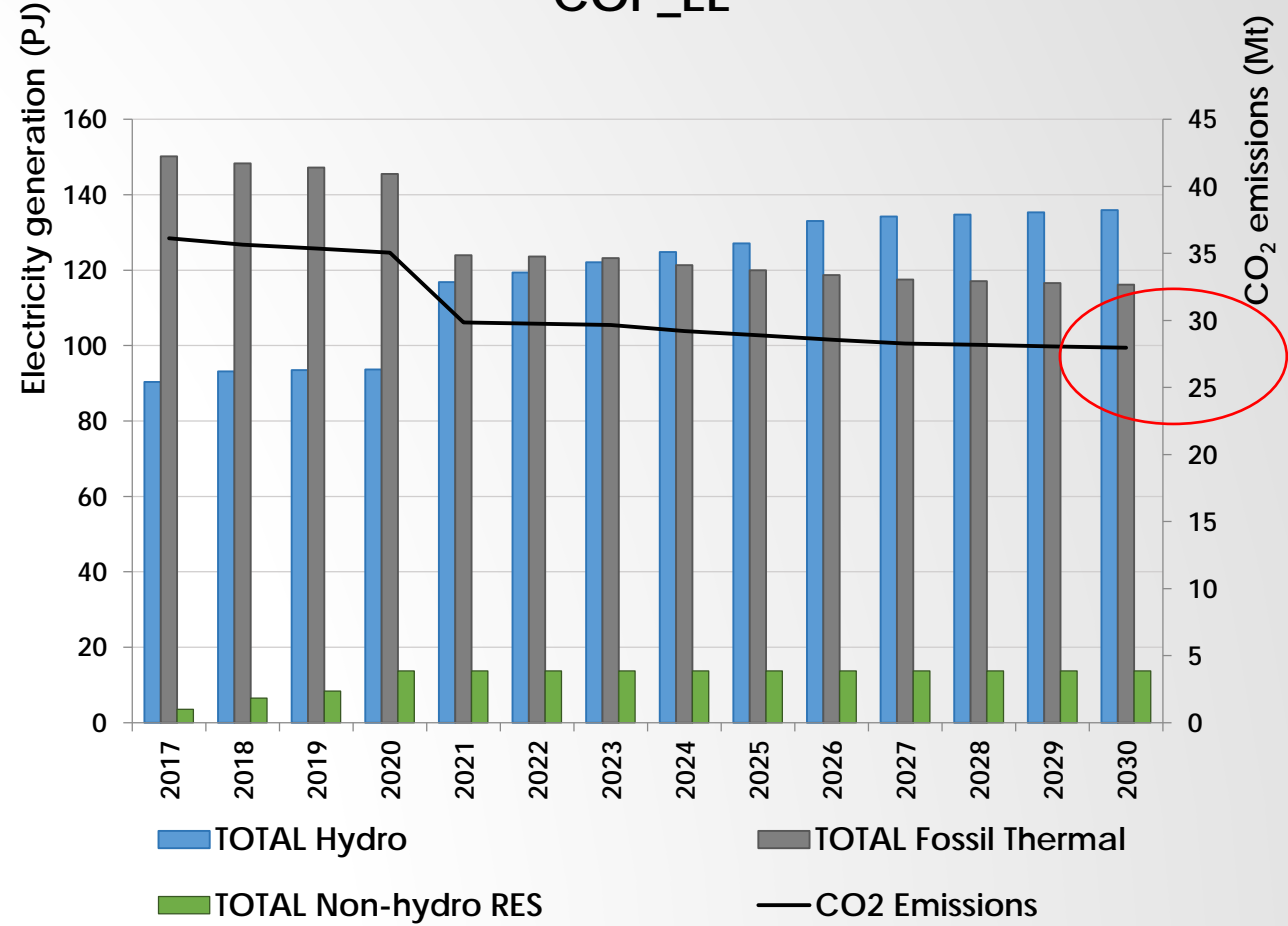


# ENERGY EFFICIENCY

## COP\_REF



## COP\_EE



# KEY INSIGHTS

- All power plants downstream can significantly increase their production, without the electricity generation upstream being compromised.
- energy efficiency measures- will have a higher impact on reducing the stress on thermal (coal) power plants and mitigating 21% of CO<sub>2</sub> emissions.
- All the three countries have potential to increase trade between themselves and with the other neighbouring countries.
- Improved cooperative management of hydro power plants and water flows as well as effective implementation of energy efficiency measures are proven to increase the electricity surplus to be traded.







**UNECE**



INTERNATIONAL SAVA RIVER BASIN COMMISSION



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