Innovative Energy Storage Technologies
Opportunities for the OSCE Area

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Message:

Finding a cost-efficient and universal solution to the question of storing renewable energy is the key to maximising its contribution to the energy mix, to improving energy security and achieving a substantial reduction of CO2 emissions.
Change in global energy demand 2017 – 2040

Source: IEA, World Energy Outlook 2018

100% of total national electricity consumption from renewable sources

45-50% share of renewable energy in final energy consumption
The “4 F” - Flexibility is Key

1. Flexibility in Energy Supply
   - sector coupling - design intelligent system solutions
   - coupling power, heating/cooling and transport sector

2. Flexibility in Consumption
   - buffering (thermal) energy for heating and cooling
   - adapt industrial and commercial processes

3. Flexibility through Storage Facilities
   - power storage (i.e. hydro pump storage, underground pumped hydro, battery storage)
   - heat storage
   - Thermal pumped-storage hydropower
   - gas storage
   - hydrogen storage (presented at the OSCE conference in Bratislava)

4. Flexibility through Smart Network Management
   - smart electricity networks
   - flexible heat networks

Production of Green Hydrogen

Source: https://www.h2future-project.eu/technology
Underground Sun Conversion

Using existing natural gas reservoirs for conversion and storage of renewable energy

Source: RAG Austria
Underground Pumped-Storage Hydropower

Thermal Pumped-Storage Hydropower

Hybrid hydraulic energy storage (heat and electricity) for energy supply of entire cities and urban areas

Source: TU Graz
Underground Pumped-Storage Hydropower combined with Seawater Desalination

The future supply of renewable energy and drinking water - Presentation at HYDRO 2019 Conference, Porto, 15 October 2019

Economic Feasibility
Summary

• **Innovative energy storage**: economically viable key technologies for green growth already exist

• **Sector-coupling, multifunctional and resource-efficient storage facilities** for global implementation

• **Underground construction** fully addresses various environmental challenges

Summary

• **Scalability** of renewable hydrogen and underground (thermal) pumped storage hydro power – **deployment regardless of location** (independence of natural topography)

• **Strengthening** national/local economy over entire lifecycle

• These innovative storage technologies will be **key success factors** of the energy transition
Summary

• **Renewable hydrogen** and underground (thermal) **pumped-storage hydro power** have great potential throughout the OSCE area

• For instance on the **Caspian Sea**, Seawater UPH combined with desalination can provide secure, sustainable and reliable energy and drinking water

• **Partnership OSCE/international financial institutions** to implement a **pilot project**, possibly within the OSCE project “Promoting Green Ports and Connectivity in the Caspian Sea Region”

Thank you!

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