1. ENERGY POLICIES: IMPLICATIONS FOR TSOS

2. STORAGE: AN OPTION TO IMPROVE SECURITY OF ENERGY SUPPLY

3. MARKET, REGULATORY, PLANNING SERVICES AND INVESTMENT DECISION

4. STORAGE: TECHNOLOGY NEUTRALITY AND INTEGRATION INTO ENERGY SYSTEM
Quick facts about ENTSO-E

- **41** TSOs from 34 countries
- **530** million citizens served
- **830** GW generation
- **300** Thousand Km of transmission lines

- Adequacy forecasts
- Ten-Year Network Development Plans
- Market Platforms
- Network Codes
- R&D Plans
Generation and demand: transformative changes
Maintaining power system stable and reliable

Increased system services
• Ancillary services: black start, frequency response, fast reserve
• Provision for reactive power
• Power flows limits
• Inertia
• Dynamic stability
• etc

Increased Flexibility

➢ Multifaceted market that satisfies the system needs
Optimal system

• Flexibility
• Capacity

- Improved grid capacity
- Operation of CHP/DH/biomass plants
- Smart grids
- Pan European Interconnections
- Energy storage
- DSR
- Grid expansion and power electronics
- Flexibility of fossil fired plants
- Ancillary services from RES
Storage: market, operational, planning services

- Market perspective
- Operational security
- Planning and Network investments

- Demand-side management
- Flexible conventional generation
- Electricity consumption: Consumers and prosumers
- Electricity networks = System Backbone
- Electricity generation: Thermal and renewable sources

Source: Grid + Storage project
Market and regulatory options for TSOs on storage

Market based option

- through appropriate market design and competition
  (operational flexibility, ancillary services and capacity markets)

Regulated option

- Strategic operational asset
Investment decision on energy storage

Stable market:

• consistent market model
• European perspective
• Reliable and adequate grid connection
• Network codes
• Common agreed CBA

Tool: CBA

Advanced CBA taking into account technological developments in storage
Energy storage: link between electricity, gas and heat networks

- Power to gas/to x
  - to optimise energy mix
- Large scale heat/cold networks
  - for seasonal storage
- Interacting and harmonised markets for electricity, heat and gas
Integrating storage into energy system

Spatial and environmental integration of storage-based solutions
Fine-tuning of optimal scale, adjustment to local climates and to specific areas.

Temporal integration of storage-based solutions
Overcome R&D issues to address reliability, technical-economical performances.

Functional integration of storage-based solutions into the system
Optimal mix, interfaces, experimental data and simulations to validate end-to-end functionalities

Grid + Storage project
Thank you for your attention