

Rapporteur Day 1 Briefing

Technology – Main Findings

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Content

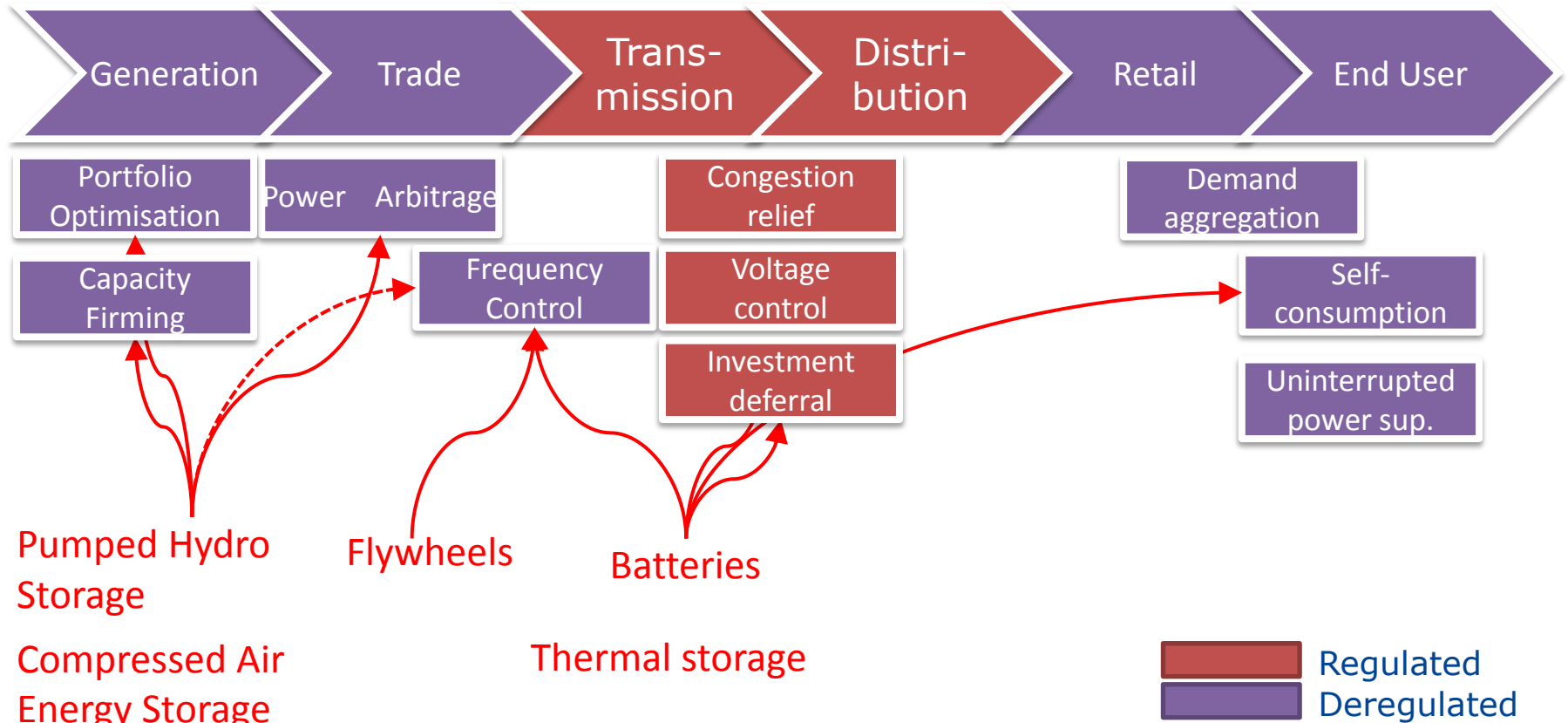
1. Why Storage and what for?
2. Storage technologies
3. Safety and standardisation issues
4. Conclusions



Why Storage and what for?

Storage is present in different parts of the energy value chain

Electricity value chain





Bulk Energy Storage

Bulk energy storage is able to balance supply and demand over large areas and across markets

Technology

Status

RD&D Trends

Pumped Hydro Storage

Mature, overwhelming market share

Can still be optimised for providing short term flexibility products

Compressed Air Energy Storage

Mature but so far only 2 units worldwide

Heat storage concepts could enable operation without natural gas or optimise economics

Power 2 Gas

First demos operating

Generate experience needed before going large scale commercial

Challenge: Economics currently under pressure!



Storage in T&D Systems

Storage can provide ancillary services needed to operate transmission and distribution systems

Technology

Status

RD&D Trends

Flywheels

Deployed in lead markets (US) for frequency control

Improve CAPEX, standardise

Batteries

Extremely wide range of technologies (some mature, others under development), mainly used in appliances or behind the meter

Energy density, longevity, improve CAPEX, fitness for stationary applications and e-mobility – materials issues

Could be come competitive outside T&D (ancillary services) in case of technology breakthrough



Thermal Storage

There exists many concepts for storing energy in the form of heat – both large and small scale

Technology

Status

RD&D Trends

Sensible heat

Many concepts, mature

Materials, system integration

Advanced concepts

Pumped heat

Potentially very economical, prototype and begin of commercialisation

Heat storage optimisation

Cryogenic storage (liquid air/nitrogen)

Prototype, potential to combine with power plant (gas turbines, nuclear)

System integration



Integration, Safety and Standardisation

Storage as an emerging technology requires new integrated approaches

Testing facilities

- Concepts need to be tested in realistic environments (sophisticated test facilities) to gain experience

Causes of accidents

- Lack of standardised validation protocols
- Insufficient incident preparedness
- Incomplete and dispersed codes, standards and regulations (CSR)

IEC TC120

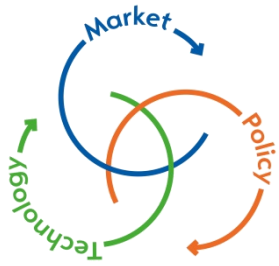
- Define standards and specifications for storage as an enabler to integrate high to 100% share of fluctuating renewable energies in existing or in new electrical systems



Conclusions

There is growing active and diverse landscape of storage technology RD&D

- Mature technologies currently not in the market
- Many emerging technologies (and concepts within technologies) from the lab to demonstration and deployment
- Testing in real environment and standardisation needed
- Different scenarios might require different technologies, keep options open
- Disruptive technological breakthroughs could change the game (technologies leaving their niches)
- Questions are raised if support, albeit increased, is adequate to keep European excellence



Thank you for your attention

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