It is widely recognised that the transition towards cleaner and more sustainable energy systems will require a significant increase in the flexibility of power systems.

Flexibility in the context of a power system refers to its ability to maintain a reliable and continuous service when faced with potentially rapid changes in supply or demand. Electricity storage can help with providing this flexibility and reducing the costs of system operation by shifting excess supply to periods of peak demand.

This flexibility means that electricity storage can offer a broad variety of advantages and benefits to system owners, grid operators, electricity producers and consumers. This importance will only grow as variable renewable energies increase their share in power grids.

The increasing share of variable renewables, such as wind and solar, inherently reduces the flexibility of a power system.

By their very nature, a high penetration of variable renewables makes the supply side more dynamic and fluctuations more severe, while also displacing existing flexible technologies.

This session explored the changing landscape for energy storage technologies, including storage reservoirs, pumped storage and other emerging and innovative technologies. It also looked at the policy and market mechanisms that can ensure stable power grids and cost-effective energy storage operations.

Speakers

- **Sakari Oksanen**, deputy director general, IRENA
- **Yves Rannou**, president and CEO, GE Renewable Energy
- **Lin Mingshan**, chairman of the board, State Grid Xinyuan Company Ltd
- **Norbert Riedel**, chief technical officer, Voith Hydro
- **Qian Ganglian**, deputy chief engineer, China Renewable Energy Engineering Institute
- **Jiang Xiaobing**, senior engineering and technical specialist, China Gezhouba Group Corporation
- **Simon Müller**, head of systems integration of renewables, IEA (moderator)
Key discussion points

This session focused on the importance of energy storage as an essential means of enabling increased penetration of variable renewables into future energy systems.

The panel agreed that pumped storage systems are not competitors to other energy storage technologies, but that each technology can complement the others in contributing to the energy transformation.

Appetite for pumped storage is increasing worldwide, especially in China. While other options such as demand-side management, transmission interconnections and supply flexibility exist, pumped storage development in the recent past had been neglected.

Appetite for pumped storage is however increasing worldwide, especially in China. In its 13th five-year plan, China is looking to optimise the regional distribution of pumped storage and accelerate its development. This includes plans to commission 17 GW by 2020, while a further 60 GW of pumped storage will begin construction in that time.

Panellists mentioned new innovations in pumped storage technology and operation. The coupling of variable speed pumped storage with long-distance high-voltage direct current (HVDC) transmission lines would allow for large amounts of variable renewable energy to be transported to demand centres.
The pumped storage plants in such a system would enable a more efficient use of transmission lines and would allow for the evacuation of variable renewable energy power.

The panel agreed, however, that significant changes needed to occur in order to see pumped storage and other energy storage technologies thrive. This requires that manufacturers have a comprehensive understanding of the entire value chain surrounding pumped storage.

Significant changes are needed to see pumped storage and other energy storage technologies thrive.

To unleash the potential of pumped storage hydropower, the panel agreed on four key enablers:
- The value and purpose of pumped storage needs to be clearly explained to stakeholders and decision makers.
- Permitting needs to be simplified on the back of changing regulatory frameworks.
- Cost reductions need to be maintained.
- Energy markets need to be redesigned as there lacks a balancing market with suitable price signals.
Key outcomes
While the importance of energy storage is clear to industry professionals, its value in terms of decarbonising energy systems needs to be better communicated to stakeholders and decision makers. This requires a fundamental redesign of licensing, regulations and market mechanisms.

Pumped storage needs to be recognised as the ‘only green battery on earth’

Further discussions emphasised that effective communication around pumped storage could improve public perception and understanding of the technology. Joining this though, a panellist observed that in effect, pumped storage was the ‘only green battery on earth’.

What next?

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2 ? l cvnjmp rhk l and summary of the market reform options that will enable increased adoption of energy storage technologies.