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## Energy Storage

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## Energy Storage

### Session background and objectives

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Power output from renewable energy, such as photovoltaics and wind, basically depends upon weather and sometimes fluctuates significantly. Therefore, as the renewable energy share increases, it tends to cause the demand-supply imbalance, and consequently to cause the frequency instability and voltage fluctuation.

Energy storage technologies play a key role to enhance energy system flexibility, and to fill the gap between electricity and / or heat supply-demand in terms of time and / or space.

- Stationary power storage system improves resource use efficiencies, and contributes to allowing more renewable power in the power grid.
- In the transportation sector, battery technology is one of crucial factors for mobile electrification, and "vehicle to grid" concept is also proposed.
- As for heat storage system, district heating and cooling systems are most widely prevailed technology, but currently a large amount of heat is wasted. Heat storage technologies have a potential to benefit energy savings significantly in the future.
- In this session, current research and development activities of energy storage technologies will be presented, and speakers will discuss and clarify what kinds of technologies will be required to realize the large share of renewable energy in the future.

### Speakers


**Hiroshi Asano**[Chair]

[CV](#)
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Associate Vice President, Energy Innovation Center, Central Research Institute of Electric Power Industry


**David Turk**
[CV](#)
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Acting Director, Directorate of Sustainability, Technology and Outlooks, International Energy Agency (IEA)

#### Abstract:

#### The Role of Storage in a Low Carbon World

Energy storage has the potential for facilitating higher shares of variable wind and solar power, enabling consumers and smartening electricity grids. Today almost all (96%) of worldwide electricity storage capacity is dominated by a very mature technology – pumped storage hydropower. The IEA estimates around 350 additional GW of storage by 2050 would be able to support cost-effective decarbonisation – however, most of it will need to come from technologies like small-scale batteries that currently account for less than 1% of all storage capacity. This talk will review the future prospects and key issues in scaling-up storage towards a sustainable energy future.

**Ravi Seethapathy**
[CV](#)
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Executive Chairman, Biosirus Inc.; Former Adjunct Professor, University of Toronto

#### Abstract:

**Role of Energy Storage in enabling large scale renewable energy in Transmission/Distribution grids and behind-the-meter applications.** Copyright © 2017 Innovation for Cool Earth Forum

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Energy storage will play an important role to realize a high penetration of low carbon renewable energy generation (wind and photovoltaic). The strategic positioning of stationary energy storage in T&D grids and behind-the-meter applications to support load demand, peak-shaving and/or support renewable generation, will be presented. This will include cases where the power grid is weak, unreliable (or has not been properly developed) with potential for "islanded" power supply from energy storage when the main grid fails. Energy storage examples and/or visions for India and other countries will be discussed including regulated and unregulated business models.



**Kari Maki** [CV](#) [View and Download Presentation](#)

Research Manager, Smart Energy and Transport Solutions, VTT Technical Research Centre of Finland

**Abstract:**

**Energy system flexibility services provided by storage units and electric mobility**

This presentation will discuss new needs for flexibility in energy systems and different manners for providing flexibility services. A special focus is on energy storages and electric mobility as flexibility providers. The presentation will review flexibility as a term, consider where and when it is typically needed and what kind of actors are able to provide it. Flexibility will be considered on different system levels, also including aggregate impacts of small units. Technical solutions and constraints for utilizing flexibility from storages and electric mobility will be discussed. New markets and business models based on flexibility services will be envisioned. Examples from research projects and demonstration cases will be utilized.



**Simon Furbo** [CV](#) [View and Download Presentation](#)

Associate Professor, Department of Civil Engineering, Technical University of Denmark

**Abstract:**

**Solar heat storage in Europe**

In the future, our energy system will completely rely on a high number of different renewable energy systems. Centralized and decentralized solar heating systems will play an important role to cover heat demands. To achieve high solar fractions, good interplay between the solar heating systems and the energy system and optimal reliable solutions heat storages with smart control strategies are of vital importance. The heat storages can store heat produced by solar heating systems and by other energy systems.

Advantages and operation experience on different heat storage types such as water pits, borehole storages and hot water tanks are given.



**Tatsushi Kurosawa** [CV](#) [View and Download Presentation](#)

Director, Global Environment Programs, Research and Development Division, The Institute of Applied Energy

**Abstract:**

**Energy Storage Roadmap**

Energy storage will work as one of important enabling technologies to assist the long-term transformation toward net-zero emissions. Energy storage technology can enhance energy system flexibility and fills the gaps in electricity or heat supply-demand in terms of time and/or space. Roadmaps are proposed for stationary energy storage for power system, mobility energy storage for transportation, and stationary thermal storage system. Technological and institutional issues are discussed.

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