Editorial

Special Issue on Energy Storage

This special issue of Journal of Thermal Science concerns with energy storage. The specific focus is on thermal and mechanical energy storage, aligning well to the scope of this Journal. Thermal and mechanical energy storage currently accounts for over 60% of global non-Pumped-Hydro installations. They have been playing important roles in our energy systems and will play an increasing role while the world moves towards a low (and even net-zero) carbon future.

The thermal and mechanical energy storage technologies are characterised by high reliability, low cost and long-life span compared with other storage technologies. Despite of these advantages, significant challenges still exist for their large scale industrial deployment. These challenges include –

- Costs - although thermal and mechanical energy storage technologies are among the cheapest as mentioned above, further reduction in the cost (CAPEX, OPEX and LCOE) is still required from a commercial perspective.
- Response time – thermal energy storage systems often have a response time of a few minutes due to heat transfer limitations, compared with sub-second scale response time of electrochemical storage systems. Unless operated in certain modes such as spin-gen, mechanical based storage systems have a similar response time as the thermal energy storage systems as the two are often coupled.
- Energy density – mechanical energy storage has a low energy density and hence is often limited by the geological and in some cases environmental constraints.
- Efficiency – for electrical storage, the round-trip efficiency of thermal and mechanical energy storage systems is lower than that of electrochemical storage systems.

There are eighteen papers in this special issue with sixteen of them on thermal and mechanical energy storage aimed to address the above challenges from different angles; and the remaining two on chemical and hybrid energy storage which are relevant and complement to the thermal and mechanical energy storage in many ways.

Of the eighteen articles, three are topical reviews covering thermal energy storage for concentrated solar power plants, photo-isomerization energy storage and compressors for compressed air energy storage. The rest fifteen are standard research articles, which can be broadly categorized into energy storage economics and policy (one), energy storage systems (six), latent heat storage (four), sensible heat storage (two), and compressed air energy storage (two).

We very much hope that these articles are of use to all energy storage stakeholders and more broadly the whole energy community, including academia, industry and policymakers.

Finally, we would like to extend sincere thanks to all the contributors, the reviewers, the journal office team and the Editor-in-Chief of Journal of Thermal Science for making this special issue possible.

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