ABBY-NET E^3-Systems Research Project Update 2019:

#17: Economics and Technology Acceptance of Distributed Energy Storage Systems Using the Example of Hybridized Flywheel Energy Storage

Muhammad Saad Arshad, Master student
University of Alberta, Department of Mechanical Engineering
email address

Research Team:
Dr. Pierre Mertiny, University of Alberta, Department of Mechanical Engineering
Dr. Sven Anders, University of Alberta, Department of Agriculture, Life and Environmental Sciences

Project summary

Efficient energy storage systems are the cornerstone in the transition of electricity systems to renewable sources. Accommodating increasing shares of renewable energy, demanded by policy-makers and the public, the deployment of flexible energy storage solutions is needed. Distributed energy storage technologies have the potential to mitigate many of the constraints faced by conventional energy storage solutions, such as pumped hydro, while also resulting in a democratization of energy production and storage by engaging non-traditional energy suppliers.

Distributed energy storage includes electrochemical applications including batteries, and more recently electro-mechanical storage systems such as flywheels. Energy storage technologies can further be hybridized to achieve optimized systems with regard to cost, efficiency, and space requirements.

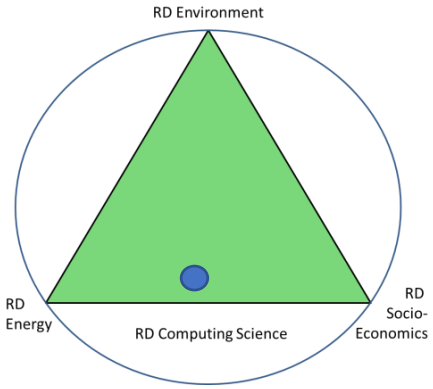
To test the feasibility of alternative distributed energy systems we seek to conduct several case applications of system designs. One case application of specific interest to us are remote Northern communities in Canada that suffer from both an expensive and uncertain energy supply.

Progress to date

The project is currently in a proposal stage.

Contribution to E3-system and Implications

A key challenge to harvesting the potential benefits of distributed energy storage technologies lies in the lack of knowledge regarding optimal system designs with regards to economic feasibility and technical performance. While questions surrounding engineering and design complexities of distributed/hybridized energy storage systems are being addressed, the economic realities of different applications and their acceptance by stakeholders and the public are largely unknown. This project seeks to develop and test methods for assessing the feasibility of distributed energy storage technologies, and hybridized flywheels in particular, that integrate engineering design, site-specific economic capital and operational cost constraints taking a transdisciplinary approach.



Geographic location

It is anticipated to perform this study considering diverse and possibly deviating socio-economic and environmental constraints in Alberta and Bavaria.

Final Outcomes

The project will engage two HQP on the Master level. As such, the outcome will be two different MSc theses, one with a focus on engineering management and one in economics. Despite their different foci, the thesis research will be arranged to maximize collaboration and collaboration between the HQP. Joint publications in peer-reviewed journals and at conferences is targeted as well.