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Request Funding for High Rate Energy Storage (Supercapacitors)

Although not explicitly mentioned in the plan, the success of many of the Themes will be dependent on the current capabilities of energy storage technology. For example, Theme S2.2 aims to Push Low-Carbon Microgrids Closer to Commercial Viability. Microgrids must be able store significant amounts of energy; in addition, they must also be able to harvest and deliver this energy at high rate. Todayâ€™s energy storage components are typically incapable of both high energy and high power; for example, Teslaâ€™s Powerwall, based upon lithium ion batteries, has published specifications showing energy densities of ~130 Wh/kg but power densities of 30 W/kg (i.e., it requires ~4 h to fully charge and/or discharge) [1]. In contrast, commercial supercapacitors have energy densities of ~5 Wh/kg and 2000-20,000 W/kg [2]. Thus, the capabilities of todayâ€™s energy storage technology typically require compromises in the energy storage architecture underlying the microgrid; for example, necessitating the use of a blend of batteries and supercapacitors (adding complexity) or overprovisioning with batteries to meet the power requirements (adding waste).

We request that the funding be provided to improve the energy density of supercapacitors to close the gap between batteries and supercapacitors, augmenting the ability to address many Themes in this report; namely, S1.6, S2.1, S2.2 and S2.3, and also aspects not mentioned; for example, electrification of diesel powered vehicles and cranes.

[1] https://www.tesla.com/powerpack
[2] http://www.maxwell.com/images/documents/Product_Comparison_Matrix_3000489_2.pdf