MUREP Small Business Technology Transfer (M-STTR) Planning Grants

Title: Model Based Systems Engineering with Digital Twin for Energy Storage Design and Development

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City/State: Tallahassee, FL

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SUMMARY:
In this project, we develop a model-based systems engineering (MBSE) with Digital Thread/Digital Twin approach to the design of energy storage systems for NASA missions. This MBSE-Digital Twin communication framework will help facilitate an integrated view and connected data flow of the energy storage system's data throughout its development cycle. Our approach will be to model the energy storage system as a common lithium-iron phosphate (LFP) type lithium-ion battery (LiB) module via a modification to the Simultaneous Battery and Capacitor Design Tool (SIMOD), and its progeny the SIMOD ECL enhanced for cycle life. This virtual LFP battery will serve as a battery emulator software (BES), which will be integrated into the MBSE. We plan to apply our MBSE tool to design a rooftop solar PV with a battery energy storage system (BESS). This MBSE tool can be extended to support NASA's mission area of "Digital Thread" Institutional Management of Health/Automated Decision Support of Agency Facilities. This MBSE tool will help accelerate the modernization of digital systems to manage the NASA's aging infrastructure, focusing on condition-based/preventive maintenance, smart buildings, smart lighting, resiliency, and other facility needs.