NASA MUREP Space Technology Artemis Research (M-STAR) Implementation Awards

Title: Sustainable Power Generation and Secure Distribution Systems for NASA Artemis Mission Institution: Florida International University
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Summary:
The proposed M-STAR implementation project, to be conducted at Florida International University, a Hispanic Serving Institution (HSI), is planned in collaboration with NASA Glenn Research Center (GRC) and aims to conduct innovative research and education in support of NASA STMD. The proposal relevance to NASA is highlighted by its objectives, fully aligned with NASA M-STAR goals, resonant with NASA and FIU strategic plans, and reflecting research and education efforts to be pursued in two integrated areas of interest to STMD: Sustainable Power Generation and Secure Distribution Systems for NASA's Artemis missions. The proposed objectives are listed below:

Objective 1. Build research capacity at FIU in Sustainable Power Generation and Secure Distribution Systems for NASA in support of the Artemis missions.

Objective 2. Engage and train FIU students in NASA-related research toward building their readiness to join the STEM and NASA workforce.

Objective 3. Increase FIU's capacity to participate in NASA Space Technology Mission Directorate opportunities.

The project is organized in three cores: Research, Education and Collaboration & Sustainability. Each core corresponds to one of the project objectives, as follows.

Objective 1 seeks to engage faculty at FIU in NASA STMD research. The Research Core will integrate research in two thrusts: 1. Sustainable Power Generation, and 2. Secure Distribution Systems. The Sustainable Power Generation thrust will develop new solar materials in the family of halide perovskites, with excellent potential to deliver high efficiency solar devices, especially in tandem architecture approaches. The team at FIU will collaborate with the Photovoltaics and Electrochemical Processes Branch at NASA Glenn Research Center (GRC) to establish methodologies for perovskite device fabrication, followed by their testing in simulated space and lunar environments. The Secure Distribution Systems thrust will entail an intelligent energy management framework with several interconnected subfunctions, capable to interact autonomously under any events. Within this thrust, FIU will collaborate with the Secure Networks, Systems Integration and Test Branch at NASA GRC. Each research thrust will engage both graduate and undergraduate students.

Objective 2 will be accomplished through activities in the Education Core and aims to engage students at FIU with NASA in research opportunities through internships and fellowships, advertise student opportunities, and develop curriculum enhancement modules. Provided the highly diverse student population at FIU, with almost 80% of students from underrepresented minority groups in STEM and 57% women, the project will have a tremendous opportunity to

recruit minority students in NASA related research. The undergraduate students will perform research under the umbrella of undergraduate research curriculum. The project will employ Ph.D. students funded both through M-STAR and other FIU mechanisms including FIU fellowships and the TA program.

Objective 3 will be accomplished within the Collaboration and Sustainability Core, focused on increasing the ability of the current team to pursue STMD funding in collaboration with NASA GRC, and on engaging additional collaborative efforts with NASA in STMD and overall space-related research.

Importantly, all three project objectives are in alignment with M-STAR Goal 4, contributing to a highly qualified and diverse NASA workforce.