

**Proposal Concept Summary:** This proposed project attempts to form an elite and agile interdisciplinary research force to investigate the application and impact of modern differential geometry and advanced distributed control/optimization theory in semiconductor-based energy generation/conversion systems. The team is expected to create an energy network innovation platform that can provide end (math framework development)- to- end (engineering modeling, simulation, and validation/partial implementation) solutions for math-engineering joint research.

**Scope of Work:** Within the period of the project, the team would like to develop a complete math framework for the energy networks using the approaches proposed above. This new math framework is expected to provide a general resiliency criterion for complex Multiphysics systems and enable new reduced-order high fidelity simulations. The team will further study the possibility of a scalable, computation-resource-independent, communication-less, distributed modeling/optimization control method for such a complex semiconductor-based switching energy network and explore its implementation/demonstration at lab scale. This project will create a math framework for interdisciplinary resiliency modeling/estimation for Complex Multiphysics Energy Systems and provide an end-to-end research platform from math to engineering research innovation.