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Research Development Fund Application – Cover Page

Application Title:	**High-Temperature Molten Salt Test Loop**
Lead contact for RDF Application:	
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Key Participating Units:	**College of Engineering** **College of Science**
Anticipated Request Amount ($):	**$500,000**

Executive summary of the intended application to utilize Research Development Funds.

Molten salt is a central feature of several advanced technologies for concentrated solar power, next-generation nuclear power, energy storage, secondary oil recovery, and cost-effective manufacture of industrial chemicals and radioisotopes for medicine. The molten salt serves both as a heat transfer fluid and for some applications as a heat storage medium. The present state of art for molten salt technology for these purposes utilizes molecular salts that operate at temperatures up to ~550 C. Funding priorities in all of the above applications focus upon extending the technology to operate with ionic salts that can operate at temperatures up to 1000 C. Ionic salts present a number of challenges for corrosion and rheology. Much work will be required to develop processes and components that can operate with ionic salts, and to validate the performance and reliability of components that manufacturers develop.

We have formed a collaboration of faculty from the Departments of Chemical, Mechanical, Nuclear, and Petroleum Engineering, Physics, and Chemistry, who have in common expertise and funded projects involving molten salt. We have obtained a commitment from Shell to donate a $5 million molten salt flow loop which they built in their Houston facility and used successfully to develop methods for secondary oil recovery. That unit was designed and operated using molecular salts, and can propel TAMU into leadership at a time when there is strong demand to bring the technology into practice. We have recruited Dan Barth, a widely respected molten salt engineer who led the design of the Shell system, to join us.

We are requesting that Shell donate the $500,000 cost of dismantling the entire system at their facility and shipping it to TAMU; we are requesting $500,000 from TAMUS to install the system at a site at the RELLIS campus, and we request $500,000 from RDF to build an ionic salt flow loop that would operate as a 'turbocharge' booster from the 550 C molecular salt loop to a secondary vessel operating at up to 1000C.

The ionic salt flow loop will provide a unique capability that is urgently sought by major DOE programs in concentrated solar power and molten salt fission. It will place Texas A&M in a dominant competitive position for funding solicitations that are about to be announced in both programs. It will provide unique capability for contracts presently in place by TAMU faculty with major companies who use the technologies, including GE, Westinghouse, Terrapower, Elysium, and Solar Reserve.

Collaborating TAMU faculty provide a strong foundation that spans the key challenges for ionic salt development: nanoparticle additions to control corrosion and rheology (Banerjee ,MEEN), molten salt fission cores (Tsvetkov, NE), molten salt safety (Mannan, ChemE), phase change materials (Banerjee, Chemistry), heat transfer (Hassan, NE), molten salt batteries (Mukherjee, MEEN), ceramics and corrosion (Clearfield, Chemistry), and phase change materials and solar energy (McIntyre, Physics).

The combination of the unique facility and the multi-disciplinary faculty team will make TAMU the go-to place for molten salt technology in the world, at a time when applications are growing by the day.