EXECUTIVE SUMMARY

Sandia National Laboratories, Los Alamos National Laboratories, The University of Florida, Texas A&M University and General Atomics have undertaken a joint project to explore the possibilities of exploiting direct energy conversion to increase the efficiency of electricity production from fission nuclear reactors. This report describes only the work performed at General Atomics during Phase 2 of this three-year project. Sandia National Laboratories leads the overall project and provides overall project reporting.

During Phase 1, the number of direct energy conversion concepts under investigation was reduced to three: Magnetic Collimator Fission Reactor, Quasi-Spherical Magnetically Isolated Fission Electric Cell Reactor and Fission Enhanced MHD Vapor Core Reactor. During Phase 2, each of the concepts has been further refined. Each of the concepts was championed by a particular laboratory:

1. Magnetic Collimator Fission Reactor — Texas A&M University,
2. Quasi-Spherical Magnetically Isolated Fission Electric Cell Reactor — Sandia National Laboratories
3. Fission Enhanced MHD Gaseous Core Reactor — University of Florida. Los Alamos and General Atomics provided support to all three concepts in areas where they have specific expertise.

General Atomics supported the Phase 2 effort in three major areas:

1. Thermal performance model of the refrigeration systems required for the superconducting magnets of the fission electric cell and magnetic collimator,
2. Stability of the fission cell cathode assembly relative to asymmetric electric forces
2. Design of the fuel recycle loop, including fission product removal, for the vapor core reactor.