Los Alamos NATIONAL LABORATORY

# Advanced Liner Technology Using VNIIEF Disk Explosive Magnetic Generators (DEMG)

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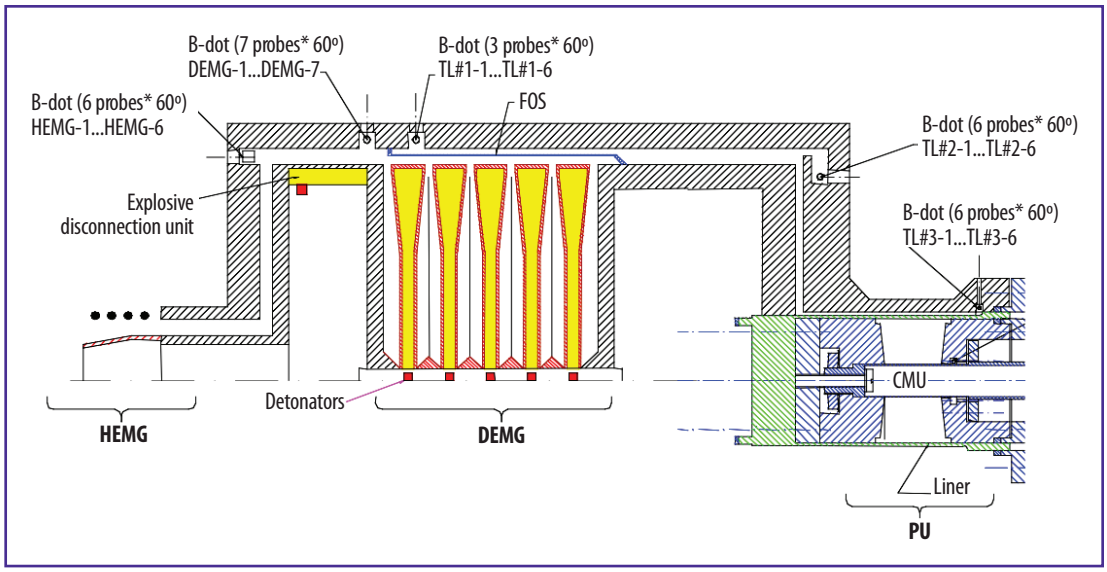
## Project Description

The objective of this project is to make Russian Disk Explosive Magnetic Generator (DEMG) technology available for use in pulsed power hydrodynamics experiments conducted in the US. VNIIEF has made substantial investments in the intellectual property identified as DEMG technology, and DEMGs have been used in several joint LANL/VNIIEF experiments. The DEMG represents the highest current, most energetic high-performance pulsed power system available today. As the owner of the technology VNIIEF can either license the technology (at a substantial price) or enter into collaborative development efforts to apply their experience by designing a new DEMG system to meet specific technical needs. LANL and VNIIEF have adopted the latter approach, which has the additional advantage of advancing the concept of collaboration as VNIIEF brings technology worth far more than the token cost of the subtask, and LANL brings application experiments, diagnostics, and some advanced simulation techniques. Ultimately, the US can purchase DEMG hardware from VNIIEF as needed, probably at a cost that is significantly below that of comparable fabrication in the US and certainly far below the cost of independently developing the technology in the US.

DEMG system for ALT-1 Experiment.

A development contract, with incremental authorizations, was awarded in FY03 as a




Schematic of VNIIEF DEMG system for conducting imploding liner experiments.

multi-year effort planned in eight phases continuing into FY09 and10. The first phase of the effort was a conceptual design study exploring a variety of experimental applications including very high pressure shock applications, hydrodynamic instabilities, and quasi-isentropic compression applications to identify the general characteristics that will be required of a new pulsed power system. In the second phase, a more detailed experimental design report was prepared focusing on one application related to the high-strain, high-strain rate (HS-HSR) experiments. Work on this project was temporarily interrupted in FY05 and FY06 because of other program requirements. The next phase of design is planned for FY07 with the potential execution of a full-scale demonstration experiment beginning in FY08 and concluding in FY09. Separate programmatic funds for the application experiments would be required beyond the existing S&T program.

## Technical Purpose and Benefits

A DEMG capability is needed for US experiments after FY07 to support pulsed power hydrodynamics experiments that cannot be conducted on Atlas or other laboratory facilities and that cannot be conducted in VNIIEF. The R-HSR series is an example a physics experiment that was conducted using VNIIEF DEMGs when Atlas was unavailable while being relocated to the DOE Nevada Test Site (NTS). Even if Atlas were available at the NTS, some experiments (e.g., ones involving special nuclear material) cannot be conducted jointly in VNIIEF and will be more economically executed in a consumable rather than a laboratory environment in the US. The DEMG capability also extends experiments to new parameters (higher energy and velocity). While a prototype experiment has been the initial design objective, the system issues are common to virtually any liner driven experiment.

ВНИИ
VNIIEF

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