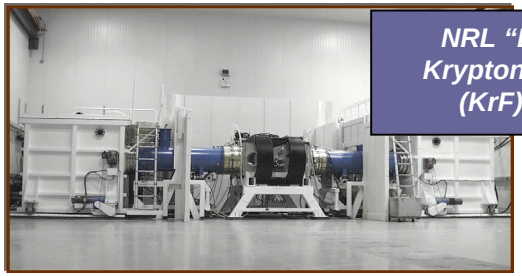
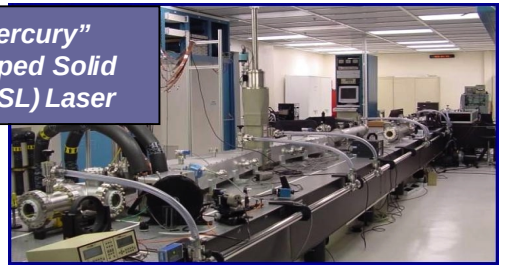
The High Average Power Laser (HAPL) Program

March 20, 2002

A coordinated, focussed, multi-lab effort to develop the science and technology for Laser Fusion Energy



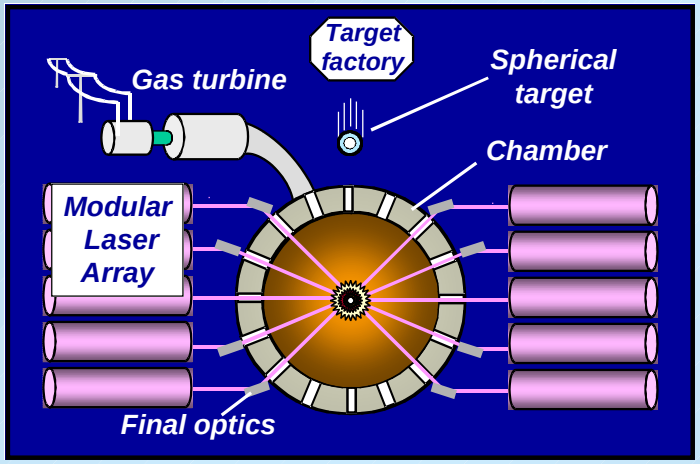
NRL "Electra" Krypton Fluoride (KrF) Laser



LLNL "Mercury" Diode Pumped Solid State (DPPSL) Laser

An Integrated Program for Fusion Energy

Based on lasers, direct drive targets, solid wall chambers



Key components developed together--"systems approach"

Modular architecture

Lowers development costs (Single beam line validates laser)
Allows multiple options for laser, chamber, optics, and targets

Significant progress recently made in all key areas;

Lasers, target design, target fabrication/injection, power plant optics, materials, chamber designs

Three-phase program:.

I: "Proof of Principle" R & D ($25 M/yr; completed by 2006)
II: Integrated research experiment with reactor laser module (2006- 2012)
III: Power plant laser-fusion test facility (operational approximately 2020)

Scientific Research Areas

Laser science (excimer and solid state)
Pulsed power, electron beam physics
High power laser optics, diodes and crystals
Low density foam polymer chemistry
Materials at low temperatures
Materials response to intense radiation
Multi-dimensional chamber clearing codes

Defense Applications for HAPL S&T

Next generation large scale lasers for NNSA (high energy, repetitively pulsed)
Compact advanced pulsed power for DoD systems
Solid state laser technology for Directed Energy
Target tracking and laser guidance systems
High damage-threshold laser optics

Participants:

National Labs: Naval Research Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratory, Los Alamos National Laboratory, Oak Ridge National Lab, Princeton Plasma Physics Laboratory.
Industry: General Atomics, Titan-Pulse Sciences Division, Schafer Corp, Science Applications International Corp, Northrop-Grumman, Coherence, Inc. Commonwealth Technology, Inc.
University: UC San Diego, University of Wisconsin, UCLA, and University of Rochester Laboratory for Laser Energetics