Welcome to the second “official” Laser IFE workshop

Discuss our progress in Laser IFE

Address some key issues as a group

- Oxidation of graphite walls
- Filling gold/metal targets
- Possibility of lower temp first walls

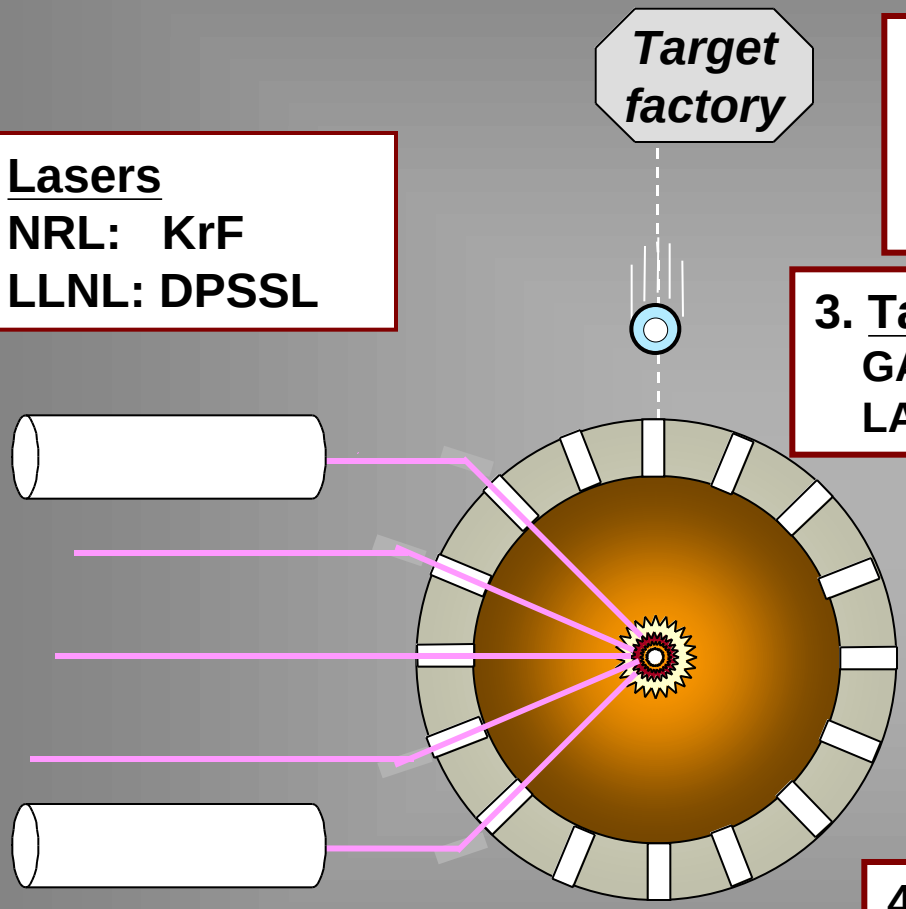
Laser IFE Materials Plan (Nasr & Lance)

The High Average Power Laser Program

Coordinated, focussed, multi-lab effort to develop a rep-rate laser facility for Inertial Fusion Energy and DP needs

- **Based on direct drive with lasers**
- **Builds upon recent DP advances in lasers and target design**

We are developing Laser IFE as an integrated system.



1. Lasers
NRL: KrF
LLNL: DPSSL

2. Target Fabrication
GA: Fab, charac, mass production
LANL: Adv mat, target fab, DT inv
SCHAFER: Foams, cryo layering

3. Target Injection
GA: Injector, Injection & Tracking
LANL: Materials prop, thermal resp.

4. Direct Drive Target Design
NRL- target design (Nike Prog)
LLNL: Yield spectrum
WISCONSIN: spectrum

4. Chambers
WISCONSIN: Dry wall, integrate design
LLNL: Other walls, neutron damage
UCSD: Chamber clearing, materials
SNL et al: Materials resp x-rays / ions
ORNL/UCLA: materials

5. Final Optics
LLNL: X-rays, ions, neutrons
UCSD: Laser, debris mitigation
LANL: Neutrons

Program Phases

Phase I (5 years)- Mission Oriented R & D

- Develop required science & technology.

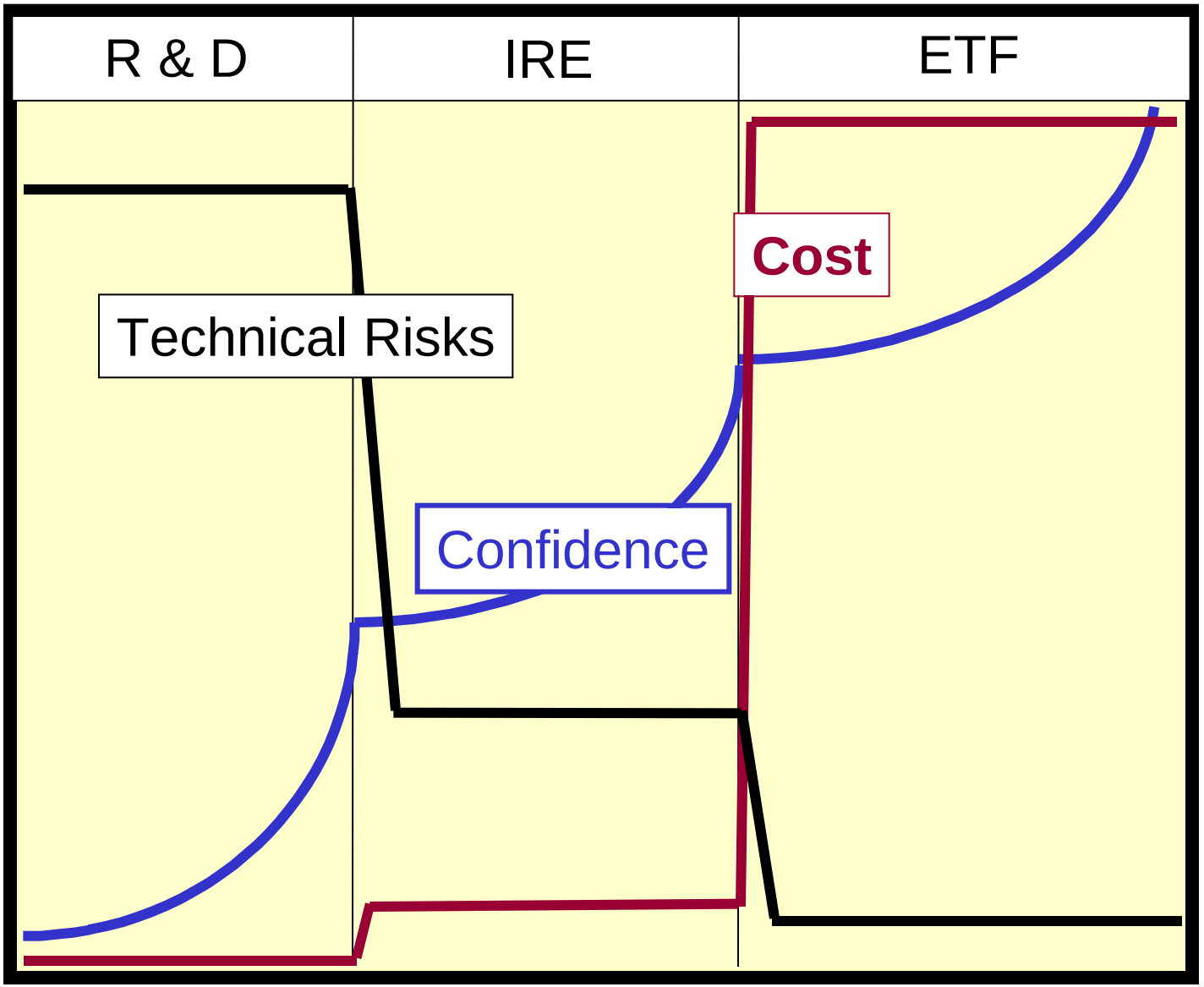
Phase II (6-7 years)-Integrated Research Experiment (IRE)

- Essential reactor components operate together with required efficiency and precision.
- Includes a full-scale laser module.
- Includes more comprehensive R & D in target fabrication, materials, and power plant design.

Phase III (8-10 years)- Engineering Test facility (ETF)

- Thermonuclear gain.
- Validate materials & components for a fusion system.
- Could also demonstrate fusion electrical power.

Program “Philosophy”

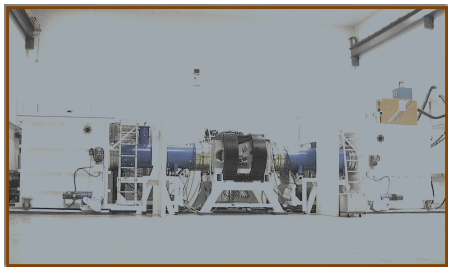


The High Average Power Laser Program

May 17, 2001

The High Average Power Laser Program is a coordinated, focussed multi-lab effort to develop a repetitively pulsed laser facility for inertial fusion energy and other DOE/DOD needs. The program has been established by scientists at the Naval Research Laboratory and Lawrence Livermore National Laboratory in conjunction with researchers at other National labs, universities, and industry[1].

A principal application for high average power lasers is inertial fusion energy (Laser IFE). The laser would symmetrically and directly illuminate a cryogenic target that has been injected into a chamber. The target is compressed and heated to undergo thermonuclear burn, and the released energy is converted to electricity. Recent advances in target design, target experiments, lasers, and associated technologies make this a promising approach for a viable energy source.



The Electra KrF Laser (NRL)

In 1999 and 2000 the program concentrated on the two most promising laser concepts: The krypton fluoride lasers (KrF) under development at NRL, and diode pumped solid state lasers (DPPSL) under development at LLNL. In 2001 the program was expanded to address all the critical components in Laser IFE, including target fabrication, target injection, final optics, and fusion chamber research. This approach assures that the components for Laser IFE are developed as coherent integrated system. The goal of this "Phase I" effort is to perform the cutting edge R & D necessary to evaluate and develop this approach. This Laser Program is closely coupled to the Heavy Ion Beam Program in DOE/OFES. The synergy and cross-fertilization between the two ensures a complete and robust US Inertial Fusion Energy program.

Mercury Diode Pumped Solid State Laser (LLNL)

Phase I should be essentially complete by 2006 with the $30M/year funding recommended by FESAC. At that time we would be prepared to build an Integrated Research Experiment (IRE) in Phase II. The IRE will provide an integrated demonstration that the essential reactor components can operate together with the required efficiency and precision. It would include a full-scale laser module for a reactor. We believe that this could be accomplished by 2012. Phase III would be a full-scale test reactor that would serve as an engineering test bed with a goal of demonstrating fusion electrical power generation by 2020. Through all phases of this work the economic and environmental issues will be considered with equal weight to the scientific and technical challenges for laser-fusion energy. The goal is to develop an attractive path to fusion energy that can help solve the Nation's long term energy needs.

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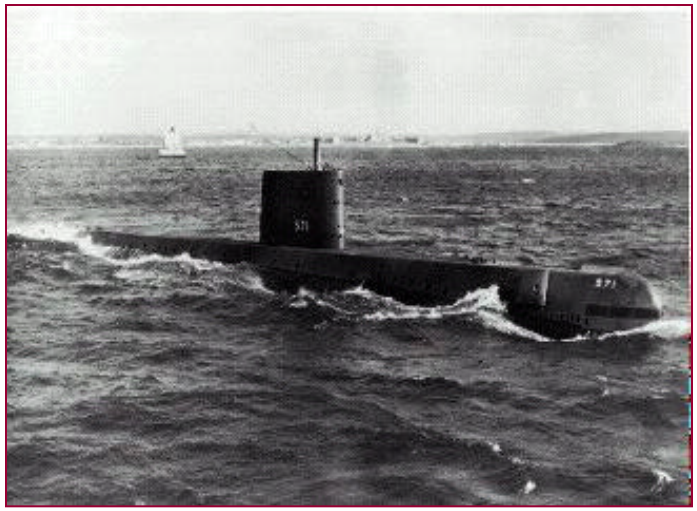
1. Other partners are: General Atomics, the University of Wisconsin, UCSD, UCLA, Titan-Pulse Sciences, Schafer Corp, Sandia National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Princeton Plasma Physics Laboratory and The University of Rochester, Laboratory for Laser Energetics.

8-10 years to develop the ETF is realistic...

Lunar Landing: 7 Years
(Kennedy speech to Armstrong lands)



Nuclear Submarine: 6 Years
(Rickover starts to *Nautilus* sails)

Goals and Timelines are important!

Focuses our research

Shows we are serious about solving the Nation's Energy needs

Turns ideas into accomplishments

and above all…...Inspires us

“Make no little plans…
they have no magic to stir men’s souls”

Daniel Burnham, architect

“Stop pussyfooting around, Batman”

Julie Newmar, aka Cat Woman

Agenda-Thursday

Agenda for Laser IFE Meeting
Naval Research Laboratory, Building 226 Auditorium
May 31 & June 1, 2001

THURSDAY, MAY 31, 2001

INTRODUCTION

8:00-8:30	Coffee, pastries, bagels, etc	All
8:30-9:00	Introduction	John Sethian (NRL)

TARGET DESIGN

9:00-9:30	Advanced High Gain Target Designs	Denis Colombant (NRL)

CHAMBERS-1

9:30-9:45	Output Spectra from Direct Drive ICF Targets	R.R. Peterson (Wisc)
9:45-10:00	Cavity Dynamics and First Wall Response	D. Haynes (Wisc)

10:00-10:15	**BREAK**	

10:15-10:35	The Potential for Graphite Oxidation in Dry Wall Chambers	G. Kulcinski (Wisc)
10:35-10:50	Oxidation of Graphite Walls	S. Reyes (LLNL)
10:50-11:20	Safety issues for Dry Wall chambers—Graphite and other candidate materials	D. Petti (INEEL)
11:20-11:35	Progress in Chamber Dynamics and Clearing Research	F. Najmabadi (UCSD)
11:35-12;00	Assessment of Dry Chamber Wall Configurations as Preliminary Step in Defining Key Processes for Chamber Clearing Code	R. Raffray (UCSD)

12:00-1:00	**LUNCH**	

CHAMBERS-II

1:00-1:30	Laser/chamber interface work Neutron damage modeling Progress in alternate chamber concepts	J. Latkowski (LLNL)

***THURSDAY, MAY 31, 2001*-CONT**

MATERIALS PLAN

1:30-2:20	The Laser IFE materials plan	L. Snead (ORNL) N. Ghoniem (UCLA)
2:20 3:10	Discuss Laser IFE Materials Plan	All

3:10-3:30	**BREAK**	

CHAMBER MATERIALS

3:30-4:00	Modeling / Expts on Z and RHEPP for IFE Materials Evaluation	C. Olson (SNL)

FINAL OPTICS

4:00-4:30	Neutrons, & x-rays threat modeling & planned expts	J. Latkowski (LLNL)
4:30-5:00	Dust & LIDT threat modeling and planned expts	M. Tillack (UCSD)

EXHIBIT

5:00-5:20	Laser IFE Power Plant Model	J. L. Cowan (LT/LLC)

7:30 Informal dinner, Virginia Brewing Co
Old Town Alexandria

Agenda-Friday

FRIDAY, JUNE 1, 2001

7:30-8:00	Coffee, pastries, bagels, etc	All

TARGET FABRICATION

8:00-8:25	Permeation filling of gold coated shells Progress in cryogenic target fielding R & D	Dan Goodin (GA)
8:25-8:40	Foam shell characterization development	F. Elsener (GA)
8:40-9:00	Cryogenic layering as applied to Laser IFE	J. Sater / D.Bittner (Schafer)
9:00-9:20	Advanced foam shell production	D. Schroen-Carey (Schafer)
9:20-9:50	Tritium inventory and mass production	A. Nobile (LANL)

9:50-10:10	**BREAK**	

TARGET INJECTION

10:10-10:30	Target Injection Studies & Equipment Design	R. Petzold (GA)
10:30-10:50	Cryogenic DT thermal response & mechanical properties	J. Hoffer (LANL)

LASERS

10:50-11:20	Electra: Kinetics codes, e-beam studies, advanced pulsed power program	J. Sethian (NRL) D. Weidenheimer (PSI)
11:20-11:50	DPPSL progress	S. Payne, et al (LLNL)

WRAP UP

11:50-12:00	Conclusions / Wrap up	All