IFE Element of the VLT

Wayne Meier

LLNL

VLT PAC Meeting

March 2-3, 2004

UCSD

Inertial Fusion Energy

Mission/Scope

Address and resolve the critical issues for high-rep-rate chamber concepts, target fabrication and injection for heavy ion and laser drivers through assessment studies, experiments and numerical simulations.

FY03/04 Highlights

- **See hand-outs summarizing IFE chamber and target work**
  - Robust point design for HIF published in FY03 (many groups contributed)
  - Positive results from UCLA flibe condensation experiment indicating high rep-rate feasible
  - Georgia Tech work on importance of jet conditioning to minimize drop generation
  - UCB experiments on disruption of jet arrays and liquid vortex chambers
  - UCSD's fundamental work on chamber dynamics modeling and experiments
  - UW shock tube experiments and modeling of liquid break-up
  - LLNL analyses of safety issues related to use of Be – chemical vs. radiological hazards
  - UCB/LLNL innovative molten salt heat exchanger design work
  - GA progress on target injection demonstration
  - LANL's innovative target fabrication techniques for hohlraum targets

Proposed FY05 Tasks for President's budget

(this page intentionally left blank)

And now a leap of faith

- Assume community leaders include IFE in request to Congress for incremental FY05 funds (looks likely)
- Assume Congress still wants to fund the IFE option (true last year)
- Assume IFE-specific language survives conference committee and gets funded (failed in FY04)

Proposed FY05 Tasks for Incremental Case of +$3.0M* in priority order

1. Continue concept development, modeling, analyses, and experiments for thick liquid wall (TLW) chambers including configurations compatible with modular solenoid driver option for HIF ($1.5M)
2. Continue safety, environmental, economic, and systems assessments for various inertial fusion facilities/ applications (synergy with MFE and Z) ($0.5M)
3. Conduct R&D on target fab and injection for indirect drive targets including shimmed HIF targets ($0.8M)
4. Begin design and planning for next stage of TLW research including large scale hydraulic test facility and molten salt test loops (synergy with MFE and Z-IFE) ($0.2M)

***(vs. $4.2M in FY03 with ARIES, $1.7M in FY04)**

Proposed FY06 Tasks for Incremental Case of +$5.0M in priority order

1. R&D for TLW chambers ($1.5M)
2. Safety, environmental, economic, and systems assessments ($0.5M)
3. R&D on target fab and injection for indirect drive targets ($1.0M)
4. Complete design and begin procurements for next stage of TLW experiments ($2.0M)

The MFE option – redirect IFE effort to MFE

- MFE chamber work was redefined/refocused to support ITER and level of funding was maintained
- IFE chamber work was zeroed
- IFE expertise can be applied to ITER work
  - Nuclear (ITER TBM neutronics, activation, tritium breeding – LLNL, UW)
  - Mechanical (ITER TBM, PFCs, magnets: engineering design, stress and thermal analyses, plasma/wall interactions – GA, Georgia Tech, LLNL, UCB, UCLA, UCSD, UW)
  - Safety and Environmental (issues related to fielding TBM in ITER – INEEL, LLNL, UW)
  - Chemical engineering (molten salt properties, chemistry control, corrosion studies to support ITER TBM option – INEEL, LANL, UCB)

The HEDP option – redirect IFE effort to HEDP

- HIF program is being refocused on HEDP for the near term
- IFE chamber work could support this work
  - Driver/chamber interface – chamber conditions required to allow required focusing (applicability of liquid targets, ablation, condensation)
  - Survival of final optics and diagnostics given x-ray, ion and debris threat
  - Driver systems modeling for HEDP
  - HEDP target requirement (including rep-rated)
  - Planning experiments for NIF relevant to IFE chambers

Key Concerns/Issues

- General demise of IFE within OFES including redirection of HIF to HEDP
- Lack funding for IFE in areas required for a viable program
  - Chambers
  - Target fab and injection
  - Materials
  - Safety and environmental
  - Driver/chamber interface
  - Systems integration and modeling