

Harnessing Fusion Power Theme Workshop - Introduction

Wayne Meier, LLNL



**Research Needs Workshop (ReNeW)
Theme IV - Harnessing Fusion Power
UCLA
March 2-4, 2009**

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Fusion Power Theme Leaders

- Chair: Wayne Meier, LLNL
- Vice-chair: Rene Raffray, UCSD
- OFES Champion: Barry Sullivan

Panel Leaders

- Scott Willms, LANL
- Neil Morley, UCLA
- Rick Kurtz, PNNL
- Phil Sharpe, INL
- Wayne Reiersen, PPPL

We started with the Greenwald report*

“The themes were defined in terms of **knowledge required prior to Demo**. In the definitions, we insist that the knowledge gained must be based on sound scientific principles and rigorously tested in the laboratory so that the **step to demonstration power reactor would be taken with high confidence of success.**”

* Priorities, Gaps and Opportunities: Towards A Long-Range Strategic Plan for Magnetic Fusion Energy

Top Level Issue from Greenwald

Harnessing Fusion Power:

The state of knowledge must be sufficient to design and build, with high confidence, robust and reliable systems that can convert fusion products to useful forms of energy in a reactor environment, including a self-sufficient supply of tritium fuel.

The Fusion Power Theme has five Panels

- Fuel Cycle – Scott Willms
- Power Extraction – Neil Morley
- Materials – Rick Kurtz
- Safety and Environment – Phil Sharpe
- Reliability, Availability, Maintainability, Inspectability (RAMI) – Wayne Reiersen

The workshop is structured to help develop the information we need for our report

Theme Chapter

- **Introduction (1 – 2 pages)**
- **Research Gaps and Needs (about 6 pages for each panel)**
 - *Research needs:* What are the compelling scientific questions that must be answered to resolve these issues? What skills and expertise are needed? What tools (plasma parameters/ conditions, facilities, diagnostics, supporting theory and codes) are needed to address these issues and gaps?
- **Research Thrusts (3 – 5 pages)**
 - Describe thrusts for this Theme. These are *brief* (1 page or less) descriptions, to be amplified in second part of Report.
- **Plan (2 - 3 pages)**
 - Discuss the logical and temporal relationships among these thrusts.
 - Identify relationships to other Themes as applicable, e.g. opportunities for multi-purpose thrusts.
 - Summarize the plan for this theme.

The workshop is structured...(cont.)

Research Thrust Chapter (for each thrust)

- **Introduction (1-2 pages)**
 - Scientific importance, opportunities, and urgency related to this thrust.
 - What important and/or exciting scientific questions (includes engineering and material science) will this thrust try to answer?
 - What opportunities does it realize? (new understanding, technical innovation, capabilities and partnerships)
- **Scientific and Technical Research (3-5 pages)**
 - Description of each element of thrust, with sufficient detail to allow rough schedule and cost estimate (is it a decade long activity or a 3 year task?). Description of how elements combine into consistent, integrated thrust.
- **Benefits for Magnetic Fusion Energy (1-2 pages)**
 - How would this campaign make progress toward magnetic fusion energy?
 - What is relation to other thrusts?
 - What other scientific benefits (outside of fusion?) would be gained?

Overview of agenda

- Monday AM
 - Introductions by Panel Leaders covering issues, gaps and research needs
- Monday PM
 - Fuel Cycle Panel Session
 - Safety and Environment Panel Session
- Tuesday AM
 - Power Extraction Panel Session

Overview of agenda (cont.)

- Tuesday PM
 - Materials Panel Session
 - RAMI Panel Session
- Wednesday AM
 - Joint session with Taming the Plasma Material Interface Theme
- Wednesday PM
 - Parallel FP sessions to discuss thrusts
 - Plenary FP session to discuss/integrate thrusts and work assignments

Personal comment

- First of all, I am very pleased that the Harnessing Fusion Power Theme has been recognized by the Greenwald panel as one of the 3 top level issues, and is included in ReNeW.
- This workshop and the broader ReNeW process is an opportunity to highlight the daunting challenges in developing fusion as an energy option.
- At some point (hopefully soon), the priority and funding for the required R&D highlighted by the Fusion Power Theme has to be on a par with, and eventually exceed, plasma science.
- Without a move in that direction, fusion will continue to be ignored as a serious energy option.

Harnessing Power – We need a more robust effort!



GAP



Hamster power



Clydesdale power

Thanks to...

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 - UCLA Plasma Science and Technology Institute
 - Department of Mechanical Engineering
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- All workshop attendees for their participation this week.