



ARIES Town Meeting

“Edge Plasma Physics and Plasma Material Interactions in the Fusion Power Plant Regime”

Meeting Goals and Logistics

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UC San Diego



What is an “ARIES Town Meeting”?

- The ARIES program occasionally organizes town meetings and workshops to provide a forum for discussions between scientists from R&D programs and power plant studies:
 - To help guide R&D programs towards solutions that lead to an attractive fusion power plant.
 - To help guide design studies toward concepts that are consistent with the best and latest understanding of plasma science and technology.



Previous ARIES Town Meetings

Mar. 2-3, 1995	ANL	Workshop on Liquid Target Divertors
May 10, 1995	ANL	Starlite Town Meeting on Structural Materials
Jan. 31, 1996	UCSD	Starlite Town Meeting on Low Aspect Ratio Spherical Tokamaks
June 19, 1997	UW	ARIES Town Meeting on Designing with Brittle Materials
May 6-7, 1998	UCSD	ARIES Town Meeting on ST Physics
Jan. 18-19, 2000	ORNL	International Town Meeting on SiC/SiC Design & Material Issues for Fusion Systems
Mar. 6-7, 2001	Livermore	ARIES Tritium Town Meeting
May 5-6, 2003	Livermore	ARIES Town Meeting on Liquid Wall Chamber Dynamics
Sept. 15-16, 2005	PPPL	ARIES Compact Stellarator Physics Town Meeting
Dec. 10-12, 2008	UCSD	International HHFC Workshop on Readiness to Proceed from Near Term Fusion Systems to Power Plants

2 Examples of Successful Town Meetings

SiC/SiC Town Meeting, January 2000

Objective: Gather the international SiC/SiC design and materials communities to exchange information, identify design-related critical issues, discuss latest R&D results, and provide guidelines to help focus future effort (reference properties, R&D goals, *etc.*)

Organizers: M. Billone, R. Raffray

Attendance: EU (5), Japan (9), US (17)

Major Output: Update material and design communities with latest developments; identify major material issues for design; recommend most appropriate values of properties to be used in design studies.

FED journal article: *“Design and material issues for SiC/SiC-based fusion power cores”*

IHFHC Workshop, December 2008

Objective: Characterize the status of current HHFC design concepts for power plants, compare to the present database for near term (ITER-like) concepts, and better understand how to evaluate gaps and R&D needs for power plant HHFC concepts.

Organizers: R. Raffray, D. Whyte, R. Nygren

Attendance: EU (8), Japan (1), US (24)

Major Output: Review current ITER and power plant PFC design and R&D status; document operating conditions for ITER and power plants; describe PFC and PMI gap from ITER to a power plant.

FED journal article: *“High heat flux components - Readiness to proceed from near term fusion systems to power plants”*



Edge plasma, PMI and PFC issues are currently a high priority

- FESAC (Greenwald panel) report defined “Taming the plasma material interface” as one of 3 major themes recommended for the program.
 - “Priorities, Gaps and Opportunities: Towards A Long-Range Strategic Plan For Magnetic Fusion Energy,” Oct 2007
- ReNeW (Research Needs for Magnetic Fusion Energy Sciences) activity reconfirmed and elaborated on this conclusion.
- Strong OFES support currently exists.
 - E.g., comments on “Research beyond the last closed flux surface”, from E. Synakowski presentation, “On an Emergent FES Vision”, March 9, 2010.



On the scope of this area...

- In discussions with Office of Science leadership, I have defined a major leading challenge as being quite broad, but I think you may agree with my intent: *building on Greenwald and the MFE ReNeW, a leading challenge for fusion, and an opportunity for the U.S., pertains to understanding and controlling*
 - the processes beyond the last closed flux surface, including the open field line plasma physics, the plasma/material science governing the plasma-surface interactions, and how these processes couple to define the close flux surface boundary, and
 - the nuclear science related to structural evolution, integrity, and harnessing fusion power
 - the coupling of these non-nuclear and nuclear elements
- The materials science per se represents the most urgent need, but the open field line science/divertor issues are quite urgent
- Overall, this represents a major, leading challenge for the field, an opportunity for U.S. leadership, and a significant responsibility



Anticipated outcomes from this meeting

- Better understanding of the interconnected science and technology issues of the plasma edge and plasma-facing materials and components.
- Definition of the R&D gaps from present-day devices to power plants.
- New channels of communication within the community.
- Documentation.
- Follow-on workshops?

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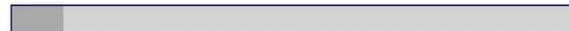
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Refreshment breaks

- Morning (pre- and mid-meeting) and afternoon coffee breaks
- Keep food or beverages **outside** the meeting room, *Please!!!*
- Café Roma next door
- Lunch on your own
 - Price Center, next to CMRR, has many fast food options
 - Shorter lines if we break before noon
 - Student cafeterias (e.g. Canyon Vista, OceanView Terrace, Café Ventanas) are a 15-minute walk
- Restrooms just outside the meeting room

Group Dinner



- Pinnacle Room (upstairs) of the Rock Bottom Brewery.
- Pre-registration was required by the restaurant (the food is already being prepared).
- For those who pre-registered, a \$30 cash fee is required. Please pay at the registration desk.
- 2 free drinks included.
- **Location:** 8980 Villa La Jolla Drive, adjacent to campus, between Sheraton and Residence Inn.
- Drinks at 6:30, dinner at 7:00



Session 1. Background and power plant requirements

Chair: A. R. Raffray

9:00 **S. Lisgo (ITER)** “Description of ITER’s edge regime”

9:30 **F. Najmabadi (UCSD)** “Edge plasma and PMI concerns for fusion power plants”

10:00 *Coffee break*

10:30 **L. Snead (ORNL)** “PMI materials behavior & constraints in a reactor environment”

11:00 **R. Nygren (SNLA)** “HHFC designs & constraints in a reactor environment”

11:30 *Lunch break*