

Announcement of PMI Community Workshop and Call for White Papers

R. Maingi, S. Zinkle –3/5/15

Recently Dr. Ed Synakowski requested US fusion community input in four research areas highlighted in the FESAC 2014 Strategic Priorities report. In each case, community input will be solicited in the form of written input (“white papers”) and a community workshop. One of these workshops is in the area of plasma-materials interactions (PMI). The chair and co-chair for the PMI evaluation are Rajesh Maingi (PPPL, rmaingi@pppl.gov) and Steve Zinkle (Univ. Tennessee, szinkle@utk.edu).

Valuable foundational community input in the PMI area and other fusion science topics is available from several recent assessments, including the 2009 Research Needs for Magnetic Fusion Energy Sciences Workshop (ReNeW) report and community white papers submitted for the FESAC 2014 Strategic Priorities panel assessment. Particularly with respect to the ReNeW workshop, it is timely to obtain updated community input in order to identify potential innovations or understanding that may have emerged over the past 6 years relevant to the extremely challenging issue of plasma materials interactions. Therefore, we are tasked to re-evaluate the 1) scientific challenges, and 2) options for handling those challenges in ReNeW thrusts #9-12, and the part of thrust #14 dealing with plasma-facing components, including potential synergistic effects of fusion neutron damage (these thrust #14 topics will be folded into the PMI Thrust #10).

Evaluation of each thrust will be conducted by a sub-panel, with a leader and deputy, and a number of sub-panel members. There will also be a cross-cutting group to look at common solutions suggested by each thrust that may benefit multiple thrusts. The group of sub-panel leads/deputies and cross-cutting panelists, along with Maingi and Zinkle, constitute the ‘Executive Group’ mentioned in the FES one-page description of the PMI Workshop distributed several weeks ago.

Community input is needed for the workshop to achieve its goals. Community input will be accepted via several methods: 1) talks given at an open community-led workshop, and 2) two-page white papers. Submission of the two-page white papers (length limit does not include references) will be facilitated by the US Burning Plasma Organization, and instructions will be disseminated to the community at the website <https://www.burningplasma.org/activities/?article=FES%20Community%20Planning%20Workshops%202015>. The white papers should list the scientific challenges along with appropriate references, and potential solutions to those challenges where relevant. The panels will also examine the longer white papers submitted to the FESAC Strategic Priorities panel in 2014. The thrusts will conduct parallel sessions at the workshop, with details of the number of parallel session TBD. The workshop agenda for each thrust will be developed by the respective sub-panel leads, in conjunction with Maingi and Zinkle.

A three-day open workshop for community input is planned for May 4-6 at the Princeton Plasma Physics Laboratory in Princeton NJ. Executive Group members will be asked to stay for an extra half day on May 7 to discuss progress and preliminary findings from the

workshop. An Executive Group meeting in June as a checkpoint toward the final report is also envisioned, with specific details to be determined. The Workshop findings will be presented to the community in some type of public forum, likely via a Webinar. A report on the community input and workshop will be submitted to DOE by June 30, 2015.

Thrust evaluation leadership team

The sub-panel leaders and deputies are summarized below, with leader listed first. In conjunction with Maingi and Zinkle, the leaders/deputies will select several panelists (5-10 per sub-panel) from the community to help with writing the workshop report. The sub-panel memberships (writers and participants) will be posted when available.

#9: Scrape off layer/divertor physics: H.Y. Guo (GA), B. LaBombard (MIT)

#10: PMI and long pulse divertor simulators, including synergistic neutron damage effects to PFCs (from Thrust 14): J.P. Allain (UIUC), R. Doerner (UCSD)

#11: Engineering innovations for plasma exhaust challenges: C. Kessel (PPPL), D. Youchison (SNLA)

#12: Plasma core-edge integration: A. Hubbard (MIT), T. Leonard (GA)

Cross-cutting group: R. Maingi (PPPL), S. Zinkle (UT-K), D. Hill (LLNL), D. Hillis (ORNL), J. Menard (PPPL), D. Whyte (MIT)

Additional Considerations

There will be two important deliverables in this community report: (1) identifying ~10-15 high-priority scientific challenges in PMI (“priority research directions”, PRDs), and (2) discussing options to address those challenges. The largest emphasis for the workshop and report will be placed on identification of the PRDs, with lower (but meaningful) discussion of potential options to resolve the PRDs. We will strive for community consensus on (1), and a list of options for (2), along with some discussion of each. As has been the case in numerous prior Office of Science Basic Research Needs workshops, specific prioritization among the identified options will not be made, but the report will strive to convey what crucial scientific knowledge might and might not be gained for the various categories of options.

The community will be asked to consider four categories for the possible ways to address the PMI challenges: (1) upgrades to existing facilities, (2) computation and validation, (3) international collaborations, and (4) new starts. Although rigid budget scenarios will not be imposed for the purposes of the workshop discussions and ensuing report, there is clear benefit in identifying a range of near- to longer-term compelling scientific challenges along with a sober discussion of advantages and risks of these four categories to resolve the various PRDs.