

Follow-up Polling of the Early Career Fusion Scientist Community in Response to NAS Panel Feedback

April 13, 2018

1 Introduction

At the February 2018 meeting of the NAS panel on “A Strategic Plan for U.S. Burning Plasma Research” hosted at General Atomics, members of the Early Career Fusion Scientist (ECFS) community presented a [whitepaper](#) detailing the perspectives of that community on future research directions, determined through a series of poll questions. The polling was performed on a private forum, self-organized by a group of ECFS members (listed in Appendix B). The criteria for being invited to join the forum as an ECFS member were

1. Received a Ph.D. within the last 15 years (e.g. after the 2002 Snowmass meetings)
2. Actively working on problems related to the development of magnetic confinement based fusion energy (MFE) systems (generally, but not necessarily, via funding from the USDOE Office of Fusion Energy Sciences)
3. Not a “manager” in the sense of supervising more than 3–5 other members of the ECFS discussion (to facilitate frank discussions)

This document details the results of a follow-up round of ECFS polling, focused on addressing questions and feedback from the NAS panel members received at the February presentation, as well as the recent announcement of [Commonwealth Fusion Systems](#). In addition to this new round of polling, the ECFS forum moderators worked with the leaders of the American Nuclear Society Fusion Energy Division and IEEE Nuclear and Plasma Science Society to ensure ECFS members working in fusion engineering and materials development who may have missed the initial whitepaper polling were invited to participate in future discussions. In addition, the requirements for joining the ECFS forum were modified, to enable younger engineers and technologists working on MFE to participate. The new revised requirements for ECFS forum membership now stipulate that members should have received their highest degree in the last 15 years, and that they should have *either* a Ph.D. *or* 3+ years experience working in a permanent (non-student) position. However, at the time of this writing only a few (< 10) new ECFS community members have joined the forum since our previous whitepaper was submitted. We therefore believe that the demographics of the forum participants for this round of polling (quantified in one of the poll questions below) are very similar to those of the previous rounds.

2 Follow-on Survey Results

In order to address questions and comments raised by NAS members during the ECFS whitepaper discussion, an additional round of polling was performed. Four questions were posed to the ECFS community that attempted to address the fundamental themes and issues raised during the discussion. An additional question addressing the ECFS community's perspective on how the announcement of Commonwealth Fusion impacts their previous voting was also posed. The results are detailed below, and full poll results are given in Appendix A.

As in the preceding whitepaper, the questions were generally posed using the Likert scale, where respondents are presented with a statement and asked to choose from strongly agree, agree, neutral, disagree and strongly disagree. We use the following terms to indicate our level of agreement for Likert scale questions. We **strongly agree** if the total number of respondents who agree or strongly agree is over 80% and the total number of respondents who disagree or strongly disagree is less than 10%. We **agree** if over 70% of respondents agree and less than 20% disagree. We **lean towards** a statement if over 60% of respondents agree and less than 40% disagree. To provide additional information on our level of agreement/disagreement, we also provide the percentage of people who (**agree** / **disagree**) in parenthesis after each statement. Note that "neutral" was also an option in most polls. The polling results are as follows:

- The ECFS community **strongly agrees** (89 / 0) with the proposition that *"ECFS should interface with the community to help organize and develop a strategic plan."*
- The ECFS community **leans towards** (69 / 9) the proposition that *"I am eager to collaborate with, or at, internationally managed facilities abroad."* We note that the 69% agreement is just below the 70% cutoff for "agrees with," rather than "leans towards." Forum discussion of this question identified the value of international collaboration as a valuable supporting and complementary part to domestic research, but felt it could not be a substitute for a strong domestic program.
- The ECFS community is **neutral** (57 / 13) towards the proposition that *"I am excited about the prospect of working on ITER as part of the US fusion program."* We note that the 57% agreement is just below the 60% cutoff for "leans towards," rather than "neutral." Forum discussion of this question identified uncertainties in ITER modes of collaboration as a key concern for ECFS members.
- The ECFS community is **neutral** (59 / 16) towards the proposition that *"Given the recent announcements (of MIT and CFS), high-temperature superconductor (HTS) development should still become a top priority for FES."* We note that the 59% agreement is just below the 60% cutoff for "leans towards," rather than "neutral." Forum discussion of this question focused on uncertainties in interactions between CFS and FES, including possible partnering, as well as not wanting to "crowd out" other needed technology developments.
- To clarify the demographics of the ECFS forum participants, members were asked to identify what areas they primarily work on in FES research, choosing from categories identified in the **FES congressional budget breakdown** . The **top two** areas were identified as **advanced tokamaks and theory and simulation**, follow by **international collaborations** and **discovery/basic plasma science**.

A Full Survey Results

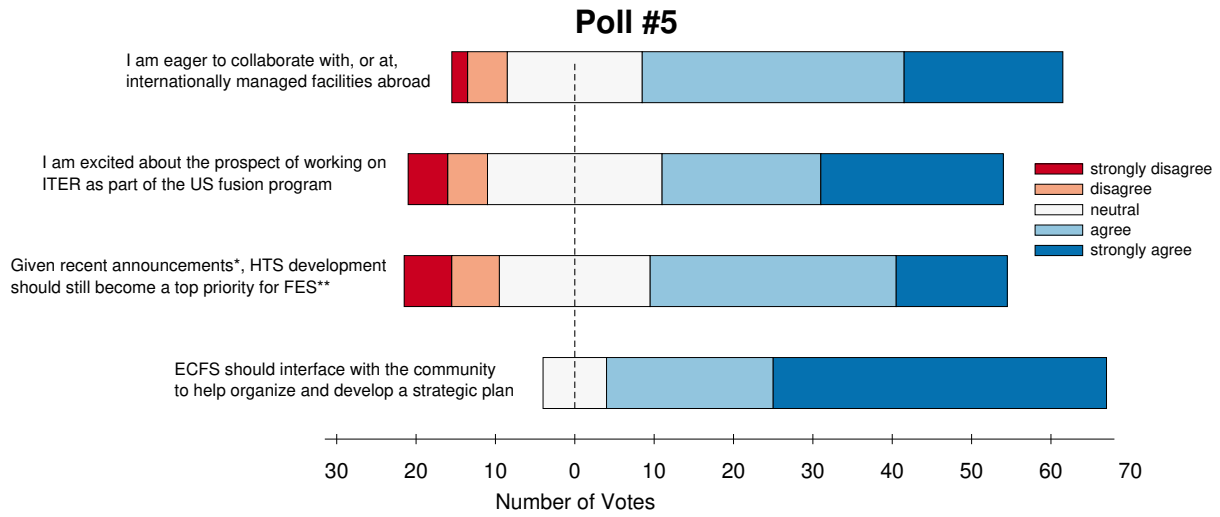


Figure 1: Summary of Likert scale poll results from Poll #5

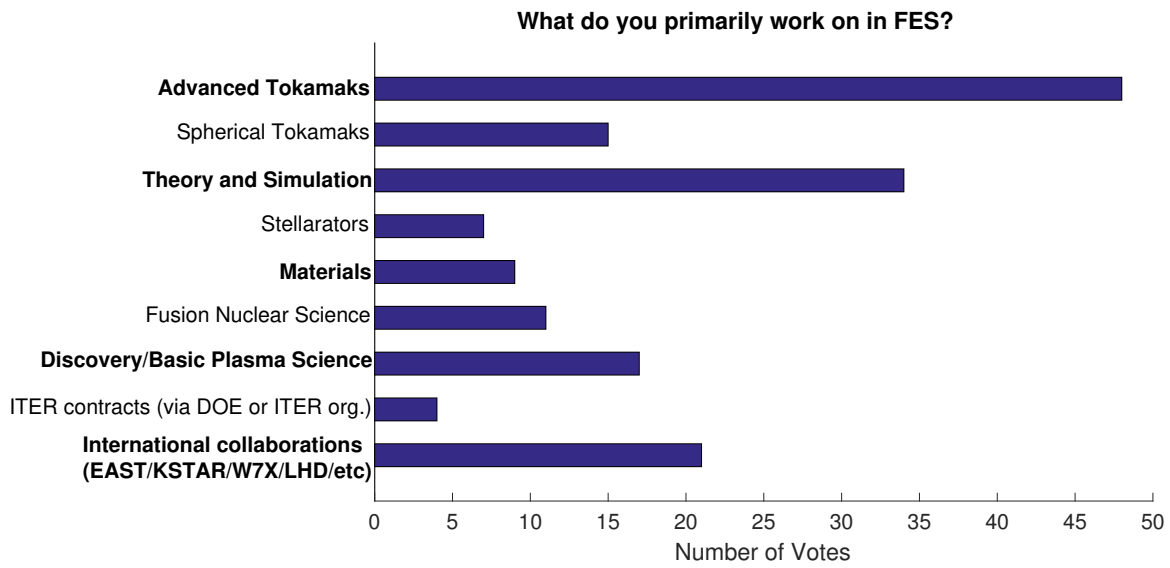


Figure 2: Demographics of participants from Poll #5

B List of Organizers

The following individuals together organized the online forum, selected the poll questions, and wrote this white paper:

Bader, Aaron (UW-Madison)

Chrystal, Colin (GA)

Diem, Stephanie (ORNL)

Guttenfelder, Walter (PPPL)

Hatch, David (UT-Austin)

Holland, Chris (UCSD)

Howard, Nathan (MIT)

Lore, Jeremy (ORNL)

Michoski, Craig (UT-Austin)

Parker, Jeff (LLNL)

Paz-Soldan, Carlos (GA)

Wilks, Theresa (MIT)