Final Technical Report

DOE-APS-20225

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Project title: **Long Range Community Planning Process for Fusion Sciences and Plasma Physics**
Name of institution: **American Physical Society**
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Executive Summary:

This grant facilitated the APS-DPP Community Planning Process (DPP-CPP) which was a strategic planning process with the goals of identifying scientific and technological opportunities in the fields of Plasma Physics and Fusion Energy Science, and making *consensus recommendations* for a strategy to address these opportunities to the DOE Office of Fusion Energy Science Advisory Committee (FESAC). The DPP-CPP was initiated by the APS-DPP executive committee in order to help FESAC fulfill a charge from DOE to develop a strategic plan for the DOE Office of Fusion Energy Science (FES). In this charge, the DOE Deputy Director for Science, Dr. Stephen Binkley, requests "that the Fusion Energy Sciences Advisory Committee (FESAC) undertake a new long-range strategic planning activity for the Fusion Energy Sciences (FES) program. The strategic planning activity—to encompass the entire FES research portfolio (namely, burning plasma science and discovery plasma science)—should identify and prioritize the research required to advance both the scientific foundation needed to develop a fusion energy source, as well as the broader FES mission to steward plasma science." The process as set out in the proposal (and below) was successful in meeting all of its stated goals culminating in the final report to the FESAC subcommittee given the charge.

Background:

In a number of science disciplines, there is a history of community desire for involvement in long term planning for the individual program. In some of these areas (Nuclear Physics, High Energy Physics, and Astronomy for example), a community-driven process brought science-based planning to decision making and brought the community together behind a cohesive vision. In all of the successful processes, the Science and Technology needs led the process. For both the High Energy community and the Nuclear Physics community, the associated APS Divisions (APS-DPF and APS-DNP) were integrally involved in facilitating the process. The rough format being followed is modeled after the Nuclear and High Energy Physics inputs. This type of process provides a mechanism for input to FESAC that follows federal regulations for community input. For the Nuclear Physics and High Energy Physics programs, these have led to reports from HEPAP and NSAC, which were considered successful from the community and the funding agencies points of view. The HEPAP P5 report is now considered the "Gold Standard" for this type of periodic self-evaluation.

The Plasma Physics community has had a similar strong desire to be involved in long term planning across the broad spectrum of areas in Plasma Science. In response to a Fusion Energy Sciences Advisory Committee (FESAC) charge and letter from the Office of Science for Fusion Energy Science (FES), the American Physical Society - Division of Plasma Physics (APS-DPP) volunteered to help organize a similar community led

process to give input to the FESAC committee charged with the task of preparing the report. This process was envisioned as following a similar structure as the previous successful Nuclear and High Energy Physics processes. A sub-committee of the DPP ExComm, with extensive input from the community, selected an Executive Committee (the Co-Chairs). These 7 people were chosen for their ability to lead in an inclusive manner this process while also being as diverse as possible in all ways, covering as much as possible the topical, institutional, gender and seniority spectrum. This group then choose a much larger organizational program committee to run the process. The Executive Committee (EC) will at the end produce strategic recommendations (iterated with the community to ensure maximum buy in) for each of four topical areas and four cross-cutting areas, generated from community input and motivated by exciting and innovating scientific opportunities in Fusion and Plasma Science. To the extent possible, the EC will prioritize among these recommendations with community consensus. Having a long-range strategic plan for the future of fusion energy and plasma science will be of great benefit to the community and the general public.

Structure and Organization:

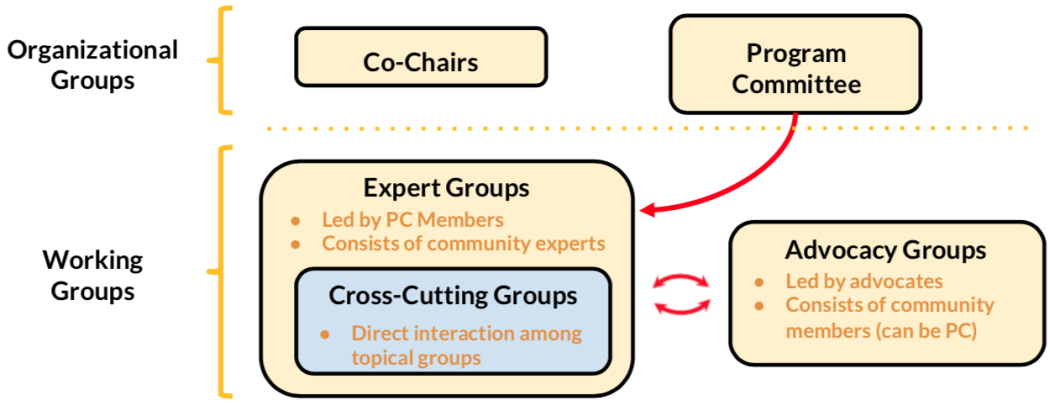
The **Co-Chairs** were selected by the APS-DPP ExComm (with extensive community input) and their role was to: Coordinate among topical and cross-cutting areas, Lead the PC to organize workshops, etc., Lead the PC in preparing the final input to FESAC, and to oversee the entire process to ensure completeness and fairness.

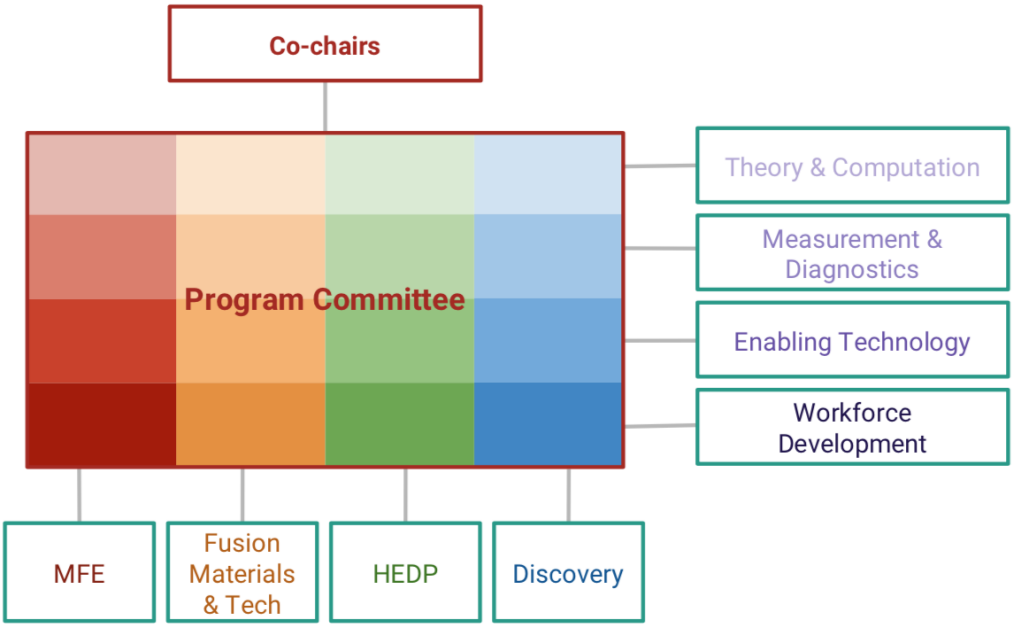
The **Program Committee (PC)** was selected by the Co-chairs (and ratified by the APS-DPP ExComm) with extensive input (and nominations) from the community. Their role was to: Organize and lead workshops (including setting dates / locations), help define expected output, Invite speakers, advocacy groups, white papers, run working group sessions, lead expert groups, summarize output from workshops, expert groups, etc.

The **Expert Groups** were led by PC members or designees and consist of community experts in pre-defined technical areas. The members are largely community members that volunteered to join but in some cases were recruited to fill gaps. The job of the expert groups was to review and refine high-priority gaps and relevant metrics, to evaluate merits of proposed initiatives for their: ability to achieve proposed mission and the feasibility of proposal and then to generate feedback for advocacy groups.

The **Advocacy Groups** was made up of self-selected Individuals, groups, or institutions who want to promote an initiative but not organized or led by PC members. The advocacy groups develop proposals for strategic initiatives, present proposals in whitepapers and at workshops, address feedback from expert groups and working groups.

The **Cross-Cutting Groups** were led by PC members and consist of community experts across topical areas. Community members could also volunteer to join. The role of the cross-cutting groups was to lead working groups at workshops, coordinate across topical areas and help identify proposals that could contribute to multiple topical areas.





Results:

The CPP encouraged and received broad engagement from the entire U.S. fusion and plasma physics community by inviting the involvement of multiple professional societies (including APS, IEEE, ANS, HEDSA, USBPO, UFA, AVS, and others) and hosting frequent town halls, webinars, hundreds of small group discussions among subject matter experts, dedicated workshops, and focus group discussions. Hundreds of whitepapers, initiative proposals, and summary quad charts were submitted by the community throughout the process. This process was extensively documented on a dedicated website (https://sites.google.com/pppl.gov/dpp-cpp).

The CPP leadership organized and ran ~32 meetings and workshops both in person and virtual (see below). From these, the community produced and submitted and evaluated over 300 new and/or revised initiatives and white papers for consideration. All of which were used as input to the process and formed the basis for the content in the final strategic plan.

After the final community meeting in Houston, the Co-Chairs modified the draft report and integrated with the community to produce the final 186 page public report (https://drive.google.com/file/d/1w0TKL_Jn0tKUBgUc8RC1s5fIOViH5pRK) for handing over as community input to the FESAC subcommittee. This report was given community consensus support which was part of the stated goal of the process.

The deliverables were:

Final report - https://drive.google.com/open?id=1w0TKL_Jn0tKUBgUc8RC1s5fIOViH5pRK
Many workshops and meetings - (see below)
Many whitepapers - https://sites.google.com/pppl.gov/dpp-cpp/home/input-and-feedback?authuser=0
An open web site documenting the process - https://sites.google.com/pppl.gov/dpp-cpp

List of Community Workshops and Meetings in support of the CPP process:
1) MFE-March 19, 2019 Town Hall , Held at TTF Workshop (Austin, TX).
2) FM&T-April 15, 2019 Community Webinar, Webinar held at 3 pm ET
3) MFE-April 17, 2019 Town Hall, Located at Sherwood Fusion Theory Conference, Princeton, NJ
4) April 18, 2019 Joint Workshop, With the NAS Decadal Assessment of Plasma Science at Princeton Plasma Physics Laboratory, Princeton, NJ
5) HEDP-May 2, 2019 Community Webinar, Webinar held at 1 pm ET led by Carolyn Kuranz, the DPP CPP co-chair for the High Energy Density Physics topical area

6) FM&T-May 9, 11 am EST-NAS Burning Plasma Report Webinar, Webinar at 11 am EST on Thursday, May 9.
7) FM&T-May 13, 1 pm EST-Webinar and Discussion on DPP-CPP Expert Groups and Proposal Submission , Lauren Garrison and Chuck Kessel, members of the DPP-CPP Fusion Materials and Technology Program Committee,
8) MFE - May 15, USBPO webinar: Planning Process for MFE: How to Get Involved Dr. Howard
9) HEDP-May 16, 2019 NAS-CPP joint meeting, This event was in Rochester, NY.
10) FM&T-May 20, 1 pm EST-Webinar for Proposal Preparation
11) DPS-May 20-21, 2019 Workshop on Opportunities, Challenges, and Best Practices for Basic Plasma Science User Facilities, This workshop was sponsored by the National Science Foundation, but anyone in the Plasma Physics Community is invited to participate remotely in this activity because it overlaps with the purpose of the DPP-CPP.
12) FM&T-June 3-4, 2019 Town Halls at SOFE, SOFE had two different but related town halls to allow maximum time for community engagement and participation. They were held at the IEEE Symposium on Fusion Engineering (SOFE) at Ponte Vedra Beach, FL.
13) MFE and FM&T- July 1, 2019 Initiative Deadline for a presentation at the MFE and FM&T workshop in July.
14) HEDP-July 1, 2019 Initiative Deadline, To submit an initiative white paper for discussion at the first HEDP workshop at the DPP-CPP website
15) DPS- July 1, 2019 Initiative Deadline, To submit initiative/proposal/white paper for DPS by July 1 to be considered for a presentation at the DPS workshop in July.
16) HEDP-First Workshop, July 16-17, 2019, The first workshop on High Energy Density Physics was held at The Hotel at the University of Maryland in the Washington, D.C. area July 16 - 17, 2019.
17) First Joint MFE and FM&T Workshop, July 22-26, 2019, The first workshop for MFE and FM&T was held on the campus of the University of Wisconsin in Madison, Wisconsin.
18) DPS First Workshop, July 23-25, 2019, The first workshop for DPS was held on the campus of the University of Wisconsin in Madison, Wisconsin.
19) HEDP-the IFE Townhall at the Z Fundamental Science Workshop, August 14, 1:15-4:30 pm MT, Was held at the Hotel Andaluz in Albuquerque, NM
20) DPS-September 26, 2019 Town Hall at LASER AIDED PLASMA DIAGNOSTICS 2019
21) FM&T-Plasma Material Interaction and High Heat Flux Expert Group weekly meeting, Wednesdays 12:00 PM Eastern / 9:00 AM Pacific, Contact George Tynan or Ane Lasa
22) FM&T-VLT Conference Call to discuss Measurements and Diagnostics September 19, Thursday 1:00 PM Eastern / 10:00 AM Pacific
23) FM&T-VLT Conference Call to discuss Magnets and Technologies September 17, Tuesday 1:00 PM Eastern / 10:00 AM Pacific
24) USBPO Webinar, October 4, 2019 Presentation to FESAC
25) MFE/FM&T Community Planning Process Webinar Series, October 16th 1:30pm EST

26) Presentation to University Fusion Association, October 21, 2019, presented at the UFA meeting at the APS-DPP
27) DPS Town Hall at APS-DPP Meeting, October 22, 2019, Ft. Lauderdale, FL
This town hall will be held from 7:45 p.m. – 9:45 p.m.
28) HEDP Community Planning Process First Webinar, October 29th 11 am - 1 pm EST
29) MFE/FM&T Community Planning Process Webinar Series, October 30th 2:00 pm EST
30) HEDP Community Planning Process Second Webinar, November 4th 1-3 pm EST
31) MFE/FM&T Community Planning Process Webinar Series, November 7th 2:00 pm EST
32) HEDP Second Workshop, November 12-14, 2019, Menlo Park, CA, The workshop was held at the SLAC National Accelerator Laboratory in Menlo Park, CA
33) Second Joint MFE and FM&T Workshop, November 18-22 2019, Knoville TN
Workshop was held at the University of Tennessee-Knoxville
34) DPS Webinars:
Create Disruptive Technologies (Friday, November 22 at 2:00 EST)
Understand the Plasma Universe (Monday, November 25, 2:00 EST)
Advance the Foundational Frontier (Tuesday, November 26, 2:00 EST)
35) CPP-Houston, January 13-17 2020, Houston TX