

FESAC Charge on Workforce Development Needs

Hantao Ji and Ed Thomas
For the Subpanel

April 10, 2014
FESAC Meeting



Department of Energy
Office of Science
Washington, DC 20585

February 19, 2014

To: **Chairs of the Office of Science Federal Advisory Committees:**

Professor Roscoe C. Giles, ASCAC
Professor John C. Hemminger, BESAC
Professor Gary Stacey, BERAC
Professor Mark Koepke, FESAC
Professor Andrew J. Lankford, HEPAP
Dr. Donald Geesaman, NSAC

From: Patricia M. Dehmer 
Acting Director, Office of Science

Charge: Assessment of workforce development needs in Office of Science research disciplines

The Office of Science research programs have a long history of training graduate students and postdocs in disciplines important to our mission needs as part of sponsored research activities at universities and DOE national laboratories. In addition, the Office of Workforce Development for Teachers and Scientists supports undergraduate internships, graduate thesis research, and visiting faculty programs at the DOE national laboratories.

We are asking the assistance of each of the Office of Science Federal Advisory Committees to help us identify disciplines in which significantly greater emphasis in workforce training at the graduate student or postdoc levels is necessary to address gaps in current and future Office of Science mission needs. As part of your expert assessment, please consider:

- Disciplines not well represented in academic curricula;
- Disciplines in high demand, nationally and/or internationally, resulting in difficulties in recruitment and retention at U.S. universities and at the DOE national laboratories;
- Disciplines identified in the previous two bullets for which the DOE national laboratories may play a role in providing needed workforce development; and
- Specific recommendations for programs at the graduate student or postdoc levels that can address discipline-specific workforce development needs.

Please submit to me, no later than June 30, 2014, a letter report describing your findings and recommendations. These results will be used to help guide future activities and investments.

If you would like to discuss the charge, please do not hesitate to contact me (patricia.dehmer@science.doe.gov). Thank you very much for your help with this important task.



The Charge to FESAC

Goals: Assessment of workforce development needs in Office of Science research disciplines

Specific Charges:

- Disciplines which are not well represented in academic curricula;
- Disciplines in high demand, nationally and/or internationally, resulting in difficulties in recruitment and retention at U.S. universities and at the DOE national laboratories;
- Disciplines identified in the previous two bullets for which the DOE national laboratories may play a role in providing needed workforce development; and
- Specific recommendations for programs at the graduate student or postdoc levels that can address discipline-specific workforce development needs.

Deadline: June 30, 2014

Subpanel Membership

Jean Paul Allain	U Illinois – UC		
Lee Berry	ORNL		
Rich Groebner	GA	FESAC	
Amanda Hubbard	MIT	FESAC	
Hantao Ji	Princeton U/PPPL	FESAC	Chair
Ray Leeper	LANL	FESAC	
Ed Thomas, Jr.	Auburn U		Vice Chair

Held first teleconference call on Monday, April 7

Identified Tasks

1. Gathering data with breakdowns on disciplines
2. Estimating future needs over the next 10 years
3. Answering the charge

1. Gathering data with breakdowns on disciplines

- 10-year old data (excluding non-fusion plasma science) from the 2004 FESAC Workforce Subpanel (chaired by Ed Thomas)

PhD Training*:

Plasma Physics	47%
Other Physics	14%
Nuclear Engineering	14%
Electrical Engineering	10%
Other Engineering	11%

2/3 Ph.D. from Physics
1/3 Ph.D. from Engineering

*Over 80% of total workforce have PhD's

Questions:

1. Were their thesis subjects consistent with their Departments?
2. What has changed since then? More like 50-50 between Physics and Engineering now?
3. Should we broaden the coverage to include non-fusion plasma science areas?

1. Gathering data with breakdowns on disciplines

- Gather data from organizations like UFA and BPO
- Gather data from FES
- Gather data through a quick survey
- Compare data from NSF and AIP on all physics and all engineering

Percentage of PhD's in each age category
(Data from National Science Foundation & Workforce Panel)

	< 35	35-39	40-44	45-49	50-54	55-59	> 60
Physics Total	12.7	14.4	15.9	14.5	11.9	12.3	18.2
Fusion Total	11.6	12.1	11.6	12.4	18.1	16.2	18.1
Electrical Eng.	17.4	21.5	17.1	10.0	8.7	11.7	13.6
Mechanical Eng.	12.2	18.6	18.7	14.9	11.3	11.8	12.5
Biological Sciences	19.4	21.3	16.5	15.3	11.3	8.4	7.9

Top-heavy in age distribution in 2004 but how about now?

- Learn from a similar German/EU excise

2. Estimating future needs over the next 10 years

- 10 years is a reasonable choice of the length
- Needs dictated by the FES budget, but what we should/can assume or project?
- Needs influenced by the ITER/NIF status, but what we should/can assume?

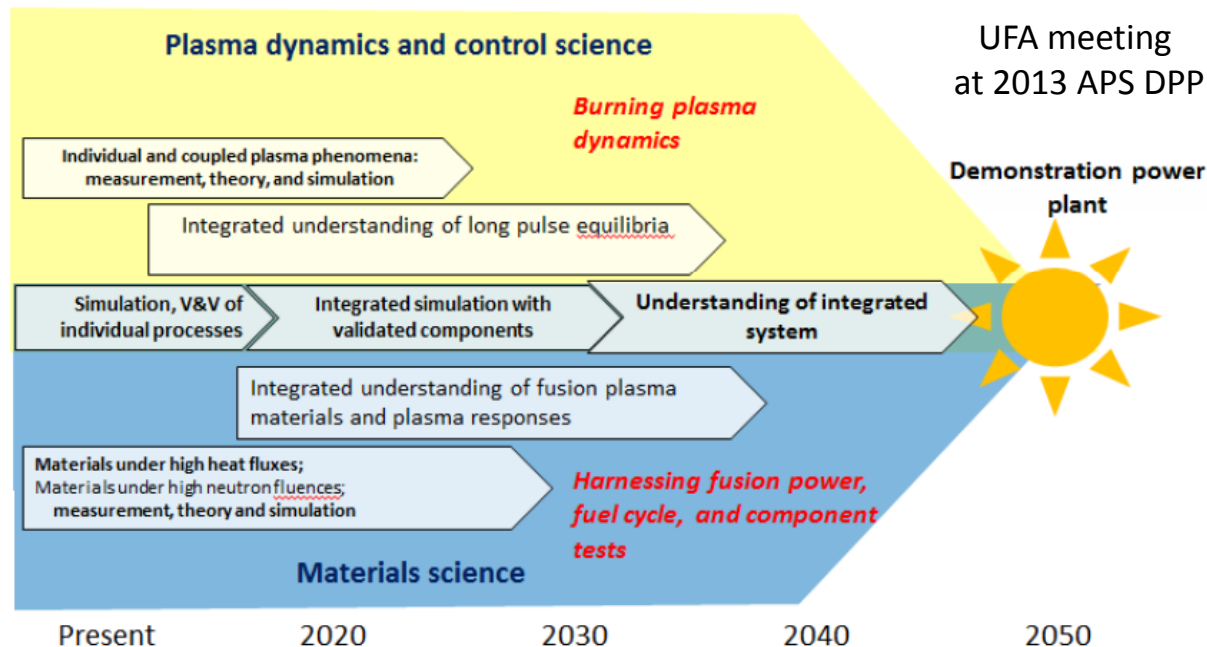
Overall change in fusion (MFE AND ICF/IFE[†]) personnel requirements over the next decade

	Plasma PhD's	Tech/Eng. Staff	Total
Retirements	70	14	84
Permanent Staff IFE	20	50	70
Permanent Staff MFE	65	35	100
Additional post-docs	45	0	45
Offsite participants	50	11	61
Need	250	110	360

Hiring rate of at least 42 Ph.D./year was projected in 2004, did this really happen?

2. Estimating future needs over the next 10 years

- Needs breakdown between different disciplines.
 - We sense areas like PMI (Plasma-Material Interaction) whose needs should go up, but with no detailed numbers
 - The 2009 ReNeW report covers all fusion areas, but with no US plans; cannot wait for the Strategy Subpanel's report



2. Estimating future needs over the next 10 years

- We will likely need to consider part of a larger problem for universities in the ITER era:
 - How do university research groups participate ITER/NIF and other large projects (domestic and international)?
 - Particle-physics or light-source models do not work exactly here due to the required close collaborations especially in MFE.
 - The NSTX model of university participation is good but not so obviously workable for the ITER.
 - Even for NSTX/DIII-D/C-Mod, anything can be done better?
 - Stronger support for smaller but more “university-friendly” programs like General Plasma Science (GPS), Experimental Plasma Research (EPR), etc.
 - Should be addressed by the 10-year Strategic Subpanel.

2. Estimating future needs over the next 10 years

- Impacted by increasing synergies with adjacent fields (e.g. astrophysics and plasma processing)
 - Increased leverages and funding stability through collaborations and partnership with other offices (e.g. ASCR) and agencies (e.g. NSF).
 - Increased visibility and intellectual depth for plasma sciences to attract best minds
 - Increased job opportunities for plasma scientists and engineers

Schedules and Processes

- Held the first conference call on April 7
- Finish “Gathering Data” and “Estimating Needs” by May 16
 - Initial data and needs by May 2 (3 weeks)
 - Finalize data and needs by May 16 (2 weeks)
- Finish “Answering the Charge” by June 13
 - Preliminary report by May 30 (2 weeks)
 - Finalize report by June 13 (2 weeks)
 - Need approval by the full FESAC through a “public” teleconference during the week of June 16-20
- Community involvements
 - Solicit inputs along with the quick survey
 - Welcome short white papers to any of the panel members by May 16
 - May be able to create a website for community discussions
 - Inquiries or initial inputs can be sent to any panel member or hji@pppl.gov

Questions for FESAC and FES

- What budgetary assumptions are to be made by the subpanel?
- What assumptions are to be made regarding the operations of ITER and NIF?
- What assumptions are to be made regarding discipline breakdown for future workforce needs?
- How much weight should be given to international activities?
- Any other questions, suggestions, and comments?