FESAC Charge on Workforce Development Needs

Hantao Ji and Ed Thomas
For the Panel

April 10, 2014
FESAC Meeting

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

Panel Membership

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

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 Report (chaired by Ed Thomas)

PhD Training*:

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

*Over 80% of total workforce have PhD's

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

Questions:

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

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 US fusion budget, but what we should/can assume or project?
- Needs influenced by the ITER/NIF status, but what we should/can assume?

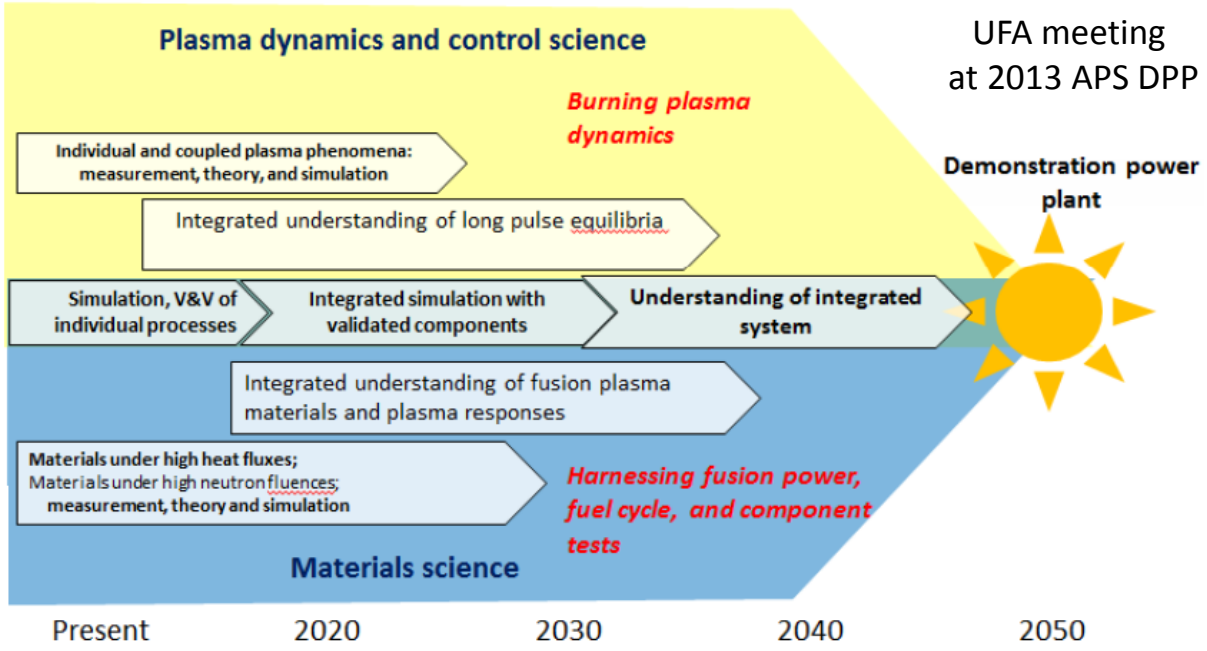
Overall change in fusion (MFE AND ICF/IFE†) personnel requirements over the next decade

	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 Panel's report



UFA meeting
at 2013 APS DPP

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.
  - 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.

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 panel?
- 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?