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

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>FESAC</th>
<th>Position</th>
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<tbody>
<tr>
<td>Hantao Ji</td>
<td>Princeton U/PPPL</td>
<td>FESAC</td>
<td>Chair</td>
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<td>Ed Thomas, Jr.</td>
<td>Auburn U</td>
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<td>Vice Chair</td>
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<td>Jean Paul Allain</td>
<td>U Illinois – UC</td>
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<td>Lee Berry</td>
<td>ORNL</td>
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<td>Rich Groebner</td>
<td>GA</td>
<td>FESAC</td>
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<td>Amanda Hubbard</td>
<td>MIT</td>
<td>FESAC</td>
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<td>Ray Leeper</td>
<td>LANL</td>
<td>FESAC</td>
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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)

<table>
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<tr>
<th>PhD Training*</th>
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<tbody>
<tr>
<td>Plasma Physics</td>
<td>47%</td>
</tr>
<tr>
<td>Other Physics</td>
<td>14%</td>
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<tr>
<td>Nuclear Engineering</td>
<td>14%</td>
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<tr>
<td>Electrical Engineering</td>
<td>10%</td>
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<tr>
<td>Other Engineering</td>
<td>11%</td>
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*Over 80% of total workforce have PhD’s

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](image)

- 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?

<table>
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<th>Overall change in fusion (MFE AND ICF/IFE) personnel requirements over the next decade</th>
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<tr>
<td>Retirements</td>
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<tr>
<td>70</td>
</tr>
<tr>
<td>Permanent Staff IFE</td>
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<tr>
<td>Permanent Staff MFE</td>
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<tr>
<td>Additional post-docs</td>
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<tr>
<td>Offsite participants</td>
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<tr>
<td>Need</td>
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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.
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?